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This is to certify that the dissertation prepared by Richard R. Bannick, entitled "Hospital Affiliations with HMOs and PPOs: An Analysis of Organizational and Market Factors Influencing Engagement in Resource Exchange Relationships" has been approved by his committee as satisfactory completion of the dissertation requirement for the degree of Doctor of Philosophy.

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Hospital Affiliations With HMOs and PPOs: An Analysis of Organizational and Market Factors Influencing Engagement In Resource Exchange Relationships

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

By

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"It was the best of times, it was the worst of times, it was the age of wisdom..."
Charles Dickens' *A Tale of Two Cities*, 1859

Pursuing this doctorate was the best of times because it granted me time to grow with my family, friends and co-workers. It was the worst of times in exacting a frenetic roller-coaster ride of highs gained from newly acquired knowledge and lows of frustration and failure. Throughout this important endeavor I was blessed with the Lord's infinite grace and my family who always kept the faith: my wife, Connie, and children, Sara and Jonathan.

This research culminates the best of efforts by a concerned and professional staff of the Department of Health Administration to impart its wisdom and knowledge to future educators and researchers. The foundation of knowledge for this dissertation rests especially on the shoulders of four experts in the field of managed care: Drs. Robert E. Hurley, Dolores Clement, Jan Clement and Lou Rossiter. Dr. Bob Hurley served as mentor and confessor in sharing his expertise in the field, and serving as Chair of the committee. He has been the quintessential professor: readily imparting his vast knowledge, willingly giving of his time and energy, astute in detecting errors of logic or understanding and gentlemanly in seeking remedy. Dr. Dolores Clement could always be counted on for a consoling word, a conscientious review, and encouragement. Dr. Rossiter's admonition in heeding the objective of "the best dissertation" provided the motivation for never straying too far from the demands of this research, and never giving up. Dr. Jan Clement's charge for critical review of the literature and logical presentation of this responding research provided structure and form for a student frequently lost among many trees but within reach of the forest's edge. I would like to thank Dr. Jack Lanier, Chair of the Department of Preventive Medicine and Community Health for his considerate reviews as the committee member from "outside" the Department: he too always provided support and encouragement as he demanded unfailing attention to the completion of credible, purposeful research.

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ABSTRACT

HOSPITAL AFFILIATIONS WITH HMOS AND PPOS: AN ANALYSIS OF ORGANIZATIONAL AND MARKET FACTORS INFLUENCING ENGAGEMENT IN RESOURCE EXCHANGE RELATIONSHIPS

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The present study had two purposes. The first purpose was to understand how the scope and diversity of hospital affiliations with health maintenance organizations (HMOs) and preferred provider organizations (PPOs) have changed over the past decade. Operating in an environment increasingly focused on price and efficiency, these managed care networks have become centrally positioned in the health care industry as critical distribution channel agents (DCAs) for buyers and hospital providers of health care services. The second purpose of this study was to evaluate the extent to which selected market and hospital attributes, particularly those related to operational efficiency, influence the decision to affiliate with DCAs.

A multiple cross-sectional design using time-series data was employed for examining the prevalence of existing, and the incidence of new, U.S. urban community hospital affiliations with DCAs. Non-parametric and logit methods were used to examine an average of 2,584 hospitals each year between 1984-1991, representing 37% of all AHA member hospitals, and 46% of all U.S. community

hospitals. Hospital affiliations with HMOs and PPOs have increased along an "S"-shaped growth curve, increasing rapidly from 1984 to 1986, and leveling off by 1988, with 83% of all community hospitals affiliated with either HMOs or PPOs by 1991. The number of hospitals affiliating for the first time has declined rapidly since 1984, with less 20 new affiliations by 1990. While 17% of the total community hospital population was unaffiliated in 1991, 3% had remained unaffiliated since 1984. Unaffiliated hospitals have generally been small in capacity, patient volume and range of ancillary services, and usually independent and not associated with other larger constituencies (e.g., multi-hospital systems).

Hospitals in 1985 with a greater mix of services were more likely to affiliate with DCAs for the first time, and to prevail in those affiliations through 1991. The level of affiliation activity in a hospital's MSA market also influenced new affiliations with DCAs in 1988, but not in 1985 or 1991. The findings show that, since 1985, newly affiliated hospitals were not significantly more efficient than unaffiliated hospitals, but that over time, affiliated hospitals have become more efficient than unaffiliated hospitals, especially with respect to managing productivity (FTEs per occupied bed) and technical efficiency. The influence of a hospital's occupancy rate relative to the market may have been important in 1985, but has diminished relative to the increasing importance of productivity and technical efficiency. The study also found PPO-affiliating hospitals were not any more efficient than non-affiliating hospitals, and cost efficiency has simply not been a critical factor in any new or prevailing relationships.

CHAPTER 1

INTRODUCTION

The U.S. hospital industry began before this nation formally declared its independence, and, like the country, has grown and changed with time. Beginning as a cottage industry designed and charitably funded for meeting the needs of the poor and disenfranchised (Starr, 1982; Stevens, 1989), the industry evolved into a major decentralized "system" of almost 7,000 specialized and general acute care hospitals serving as inpatient "anchors" or centers for other forms of health care services. The hospital industry has matured and thrived through numerous changes in its structure and in its relationship to its external environment. But increasing public and private aggressiveness in promoting unprecedented change in the delivery and financing of health care has created an uncertain environment of historic proportions for American hospitals poised on the threshold of the twenty-first century.

The emergence of the modern hospital has provided the most dramatic and impressive example of the institutionalization of medical care (Summers, 1971). Surpassing 14% of the nation's gross domestic product in 1992 (Howland, 1993), the American health care sector has been characterized as the country's third largest industry (Gabel, Jajich-Toth, Williams, Loughran & Haugh, 1987) and equal to the world's sixth largest economy (Moran, 1992). The hospital component of health care

persists in dominating the industry by capturing the largest share of dollars spent, offering the most expensive per-unit settings, and employing the most workers. The nation's hospitals have consistently received about 40% of all expenditures for health care since 1965, or twice the amount received for physician services, the next largest category (National Center for Health Statistics, 1992). Hospitals have been the most expensive setting on a per-unit basis (Feldstein, 1979), with the cost of a hospital room growing faster than any other aspect of medical services since 1970, and second only to prescription drugs for all services (U.S. Bureau of the Census, 1991). While the growth rate of the hospital work force may be tapering, it has outpaced the rate of growth of private industry for the past 30 years (Pope & Menke, 1990), employing half of all health care workers by 1991, in an industry employing 9% of the entire U. S. labor force (Himmelstein & Woolhandler, 1991).

Hospitals, as defined in this study, are usually distinguished from other organizations by several features (e.g., Griffith, 1992, pp 8-9; National Center for Health Statistics, 1992; American Hospital Association 1992). They are legally licensed institutions having at least six beds for providing inpatient care to sick patients who are usually unrelated. These patients are treated by physicians and dentists with institutional admission and treatment privileges and usually stay beyond 24 hours during which they are supervised by registered nurses and other professional clinicians. Hospitals usually contain all necessary diagnostic radiology, laboratory and surgical treatment facilities necessary for the services rendered.

Background: Transition in the Hospital Environment

The increased attention to the price of obtaining care and growing insistence by public and private purchasers for containing costs has dramatically changed the economic environment facing hospitals. This change in the environment in which hospitals operate represents the latest shift, or phase, in public and private expectations of health care. The changing environment of health care in which hospitals have played such a key role has been characterized as following several relatively distinct phases (e.g., Kovner, 1987; Starr, 1982; Stevens, 1989; White, 1982).

Havighurst's (1986) characterization of three significant shifts in the locus of control in the health care industry provides a useful backdrop for understanding how hospitals have responded to, and managed their changing environment. These three shifts, or phases are: (1) the old arrangement where health care was a privately regulated industry through decentralized professional self control; (2) followed by attempts at consolidating control with the government as the dominant decision maker; and (3) government concentration on public costs and devolution of decision making responsibility to consumers and their agents for controlling private costs. Certainly the course of hospital development has not been as linear as this or any similar historical review might suggest (Stevens, 1991). But categorizing the changing nature of hospitals during what appear to be three fundamental shifts in their general environment is useful for capturing their flexibility and initiative in survival.

The first phase of the hospital industry's metamorphosis began with the

establishment of the nation's first hospital in 1752 designed specifically for providing care to the sick (Starr, 1982). This phase included a long period of decentralized growth in community hospitals and development of an infrastructure of self control and advocacy (Stevens, 1989). Hospitals flourished into the early 1900s under the aegis of physician sovereignty, capitalizing on technological advances in the diagnosis and treatment of diseases, and emerging as a viable alternative to traditional home-based care by family and traveling physicians (White, 1982). Small scale, community hospitals proliferated further between 1946 and 1965 as both charitable and scientific institutions, bolstered by federal enabling legislation for expanding and upgrading hospital services.

Health insurance developed during this early growth phase, establishing an entrenched fee-for-service reimbursement mechanism assuring financial stability for hospitals and other health care providers (Kovner, 1987). The Baylor University Hospital prepayment plan emerged in the late 1920s, ultimately producing the first Blue Cross plan guaranteeing hospital payments beginning in 1932 (Hall, 1988), followed seven years later by the first physician-organized Blue Shield plan guaranteeing physician payment (Goldberg & Greenberg, 1985). Passage of the Social Security Amendments in 1965 providing federal and state insurance coverage for the elderly (Medicare) and the poor (Medicaid) endorsed cost-based reimbursement. During the ensuing years, the Blue Cross Associations became the primary fiscal intermediary for private as well as most public funding of hospital care, (Griffith, 1983; Stevens, 1989). The physician-based Joint Commission on

Accreditation of Hospitals also secured federal recognition as the industry monitor. Hospitals responded to the incentives of an imperfect health care market by developing extensive cost shifting and volume-enhancing methods (Newhouse, 1988, 1979; Pauly, 1986, 1980, 1977, 1968). These methods quickly became entrenched, designed to maximize revenues and oriented toward attracting physicians and their patients, rather than cost efficiency (Davis, 1972; Harris, 1977; Lee, 1971; Pauly disch, 1973; Rosenstein, 1991). Private purchasers were partially subsidized for the costs of health insurance through federal and state tax relief (Wilensky, 1982).

A few notable exceptions in the industry were the pre-paid medical group practices dating back to the 1920s and 1930s such as Ross-Loos and Kaiser Permanente (Wrightson, 1990). These regional phenomena had only a limited effect on the market share of other providers, and appealed to consumers more on comprehensiveness of benefits rather than premium prices (Starr, 1982, p. 322). Instead of receiving payment for services after their provision (fee-for-service), these plans were unique in receiving payment in advance of rendering services, irrespective of the amount used (pre-paid capitation payments). Although the Commission on the Cost of Medical Care supported the capitation method used by this plan as early as 1930, the medical profession did not sanction its use (Feldstein, 1979, pp. 280 and 332). It could be argued these and similar sanctioning tactics were useful in proscribing behavior which defied the accepted model of professional control and fee-for-service.

Havighurst (1986) contends a shift in the locus of control in the health care

industry began the second phase approximately in the 1970s as public focus on early expansionary policies shifted toward regulatory control for containing costs and correcting the maldistribution of hospital-based services and excess beds. The extensive literature on the effectiveness of regulatory efforts to control costs indicates most programs failed to achieve the desired results, such as Certificate of Need controls (Merrill & McLaughlin, 1986). Other regulatory efforts were only partially effective, such as federal price and wage controls, and hospital rate setting (Rice, 1992). Many regulatory programs were subsequently phased out or reduced during the 1980s. The Congressional Budget Office (CBO, "The Potential of Direct Expenditure Limits", 1992) noted that further regulatory efforts for controlling costs have been opposed because of these past failures. The CBO also stated continuing opposition to such efforts would require an unsustainable rate of spending, exacerbate existing inefficiencies, and penalize efficient providers.

The industry's third shift in the locus of control evolved as the public sector focused more narrowly on controlling those costs paid from government coffers while devolving responsibility for controlling private costs to the private sector. In just 12 years, from 1965 to 1977, the government's share in paying hospital costs grew relative to both consumers and private insurance, from 38% to 55%, respectively (Feldstein, 1979). Federal and state initiatives for controlling hospital costs in the 1980s were directed at shifting greater responsibility to providers for the costs of care. The prevailing federal cost-based reimbursement method changed dramatically in 1983 when the Health Care Financing Administration (HCFA) began phasing in its

prospective payment system (PPS) to constrain Medicare inpatient costs (Rosenstein, 1991). PPS was designed with financial incentives for hospitals treating Medicare patients to reduce unnecessary or redundant practices, to expedite the discharge of patients, and to discourage the admission of beneficiaries with high expected costs (Shortell & Hughes, 1988). Medicaid began evaluating alternative financing and delivery strategies in 1983 (Freund, et. 1., 1989), largely abandoning cost-based payment and relying instead on brokered or fixed rates (Goldsmith, 1988). Although the option was available since the inception of the Tax Equity and Fiscal Responsibility Act of 1982, Medicare greatly encouraged beneficiaries in 1985 to enroll in demonstrations of alternative delivery systems accepting the financial risk of a federally determined capitation payment for rendering the Medicare benefit package (Wilensky & Rossiter, 1991).

The effectiveness of PPS in constraining hospital costs has been argued as transitory given underlying inflationary pressures (Ashby & Lisk, 1992; Schwartz & Mendelson, 1991, 1992). PPS has also been claimed as ineffective in inducing physicians to practice more efficiently (Showstack, Blumberg, Schwartz & Schroeder, 1979; Wilensky, 1991). Hospitals have also capitalized on previously successful charge shifting mechanisms as well, moderating the constraints of DRG-based payments by higher payments from other sources, usually businesses (Goldsmith, 1988; Hadley & Feder, 1985; Harris, 1979; Phelps, 1986). Irrespective of these conclusions, what is apparent is that early government forays involving alternative means for health care payment and delivery provided impetus for similar action by the

private sector.

As the largest component of private payment, businesses have seen the costs of employee health benefits inflate their labor expenses, diminish their pre-tax profits (Cantor, Barrand, Desonia, Cohen & Merrill, 1991), and weaken their competitive stance (Bell, 1991; W. G. Williams, 1988). Mandatory changes in financial accounting practices have further eroded profit margins by recognizing retiree health benefits costs as liabilities on financial statements (Stern, 1991). Just as government attempted to shift partial responsibility for excessive inpatient care to hospitals, the private sector has similarly pursued a number of strategies to assume greater control over these costs, or to demand greater accountability from their agents and providers. Strategies for increasing direct control over health care payments have included self-insuring (McDonnell, Guttenberg, Greenberg & Arnett, 1986; Sullivan & Rice, 1991) and contracting directly with providers (Cimino, McNulty, Nantais, Palazzolo & Slyter, 1992; Johnsson, 1992a). Other strategies have attempted to gain price concessions from health care providers through individual purchasing power (Herzlinger, 1985), or collective purchasing power through business coalitions (Frieden, 1992a; McLaughlin, Zellers & Brown, 1989).

From the hospital's perspective, the evolving market for health care services, increasingly attuned to price, has fostered a more uncertain and potentially more "competitive" environment for two major reasons. First, hospitals have been simultaneously assailed by purchasers demanding greater accountability, and by newer provider organizations offering many of the same services as those previously offered

only in an inpatient setting, but sometimes for lower price (Christianson, Kirkman-Liff, Guffey, & Beeler, 1987; Foreman & Roberts, 1991). Hospitals have responded to this uncertainty by diversifying into many of these non-inpatient, acute care settings, and creating supplemental sources of revenue (Goldsmith, 1988).

The second source of uncertainty has arisen from the growth of large networks competing for access to purchaser beneficiaries and dollars by bidding on health benefits premium prices. These network-based organizations can minimize premium charges to compete for buyers by selectively channelling patient workload to designated hospitals and other providers accepting the terms and conditions of network affiliation. Networks can also aggressively manage service utilization by those selected providers through various monitoring systems, controls and incentives. The confluence of intensifying private and public purchaser demand for cost-effective health care and the expanding presence of large networks competing to meet that demand by "managing" their affiliated providers has placed hospitals at a critical juncture in the 1990s.

Statement of the Management Problem

From the hospital's perspective in the 1990s, two types of networks in particular, health maintenance organizations (HMOs) and preferred provider organizations (PPOs), jeopardize existing sources of patients and prevailing referral patterns. Using a network of "preferred" providers to deliver services to a specified

population, both organizational forms are distinguished from traditional fee-for-service arrangements in managing provider utilization, pre-arranging fees in advance of treatment, and guiding patients to use network providers. As Coile (1986) noted in his earlier predictions of the "New Hospital" of the future, the very "life-blood" of hospitals surviving into the next century will be drawn from contracts with HMOs and PPOs. In this context, then, the term "affiliation" as used in this investigation refers to contractual relationships between hospitals and HMOs or PPOs in which hospital services are provided on a basis that extends beyond emergency or unplanned care as identified in a formal, written contract specifying the obligations of each party.

HMOs are generally characterized by receiving a fixed and prepaid fee, irrespective of service use, thereby accepting financial risk for providing or arranging a stated range of services (Boland, 1991). PPOs contract to obtain a level of services based on discounted fee-for-service arrangements (deLissovoy, Rice, Gabel & Gelzer, 1987). By 1992, HMOs and PPOs collectively represented established networks of various providers affiliated with 1,500 plans and over 124 million members (Marion Merrell Dow, 1992, "HMO" and "PPO" editions). HMO and PPO membership has quadrupled since 1983, comprising one-half of the U.S. population, and two-thirds of those who are privately insured in 1992.

HMOs and PPOs can potentially channel large numbers of patients and the associated revenue for their health care to contractually selected, or "preferred" providers, and openly do so for cost concerns. Networks can significantly influence the behavior of selected providers using differing combinations of incentives and

disincentives, monitoring and sanctioning aberrant service utilization, and inducing their beneficiaries to use only network providers. Proponents of these managed care networks argue they may be more successful in curbing unnecessary costs because the economic incentives inherent in competing for purchaser contracts based on premium prices for specified benefits requires them to cost-effectively manage the utilization of health services (Enthoven, 1986).

Network competition for large contracts has been reinforced by public policies to reform health care in 1993 as federal and state initiatives converge on the potential for regional networks to control unnecessary costs through "managed competition" (Enthoven, 1993, Reinhardt, 1993; Starr & Zelman, 1993). The Clinton Administration's emphasis on "managed competition" as a cornerstone of its policy development is noteworthy for two reasons. First, it places public emphasis on controlling health care costs at the forefront of activities the federal government is expected to pursue. Second, although public sector efforts to reform the health care industry have been attempted before (Anderson, 1991; Blendon, 1991; Somers, 1971), the policy debate in 1993 is unique in emphasizing the centrality of managed care organizations.

Increased network influence presents two significant threats to hospitals. First, by controlling where and when members seek acute inpatient care, networks can disrupt the hospital's prevailing patient flows cultivated to maintain a relatively predictable volume of business. As these networks expand into existing hospital markets, hospitals must consider whether to affiliate with them to maintain or improve

their patient bases, or, to remain independent and pursue other strategies for continued survival. Hospitals must critically evaluate the extent to which contractual affiliation with these entities will serve their interests. The initial problem facing hospital management is to understand the opportunities for or threats of developing exchange relationships with HMOs and PPOs. Management must identify when, to what extent (e.g., reimbursement mechanism, risk sharing), and with which entity it might be prudent to pursue such a strategy.

The increasing ability of these networks for profoundly influencing affiliated providers presents the second threat facing hospitals. Hospitals that have already affiliated, or are contemplating affiliation with these networks, must consider the degree to which such contractual linkages will affect the performance and sovereignty of their institutions. Hospitals must carefully manage these affiliations, balancing the need for critical resources such as patient referrals, while minimizing constraints on their ability to pursue other goals and missions in a relatively autonomous manner (Higgens & Meyers, 1987).

Purpose of the Present Study

The purpose of this study is two-fold. The overarching purpose is to understand better the scope of hospital involvement during the past decade with two predominant forms of network-based managed care, HMOs and PPOs. This purpose focuses on the question: "To what extent have hospitals become, or are in the process

of becoming, affiliated with HMOs and PPOs?" The second purpose of this study is to answer the question: "For what reasons and under what conditions do hospitals establish linkages or exchanges with HMOs and PPOs?" This purpose addresses the determinants of affiliation from the hospital's perspective because early empirical evidence suggests hospitals have been as likely to initiate negotiations leading to contractual affiliations as HMOs (Kralewski, Countryman, & Shatin, 1982).

Theoretical Framework: Resource Dependence

Organizational performance can be viewed and understood from a resource dependence perspective that considers how organizations influence, and are influenced by (i.e., are "open" to) their environment (Scott, 1987). Operating in a relational context to its environment, organizational survival and performance often depend on critical linkages to other organizations in the environment (Oliver, 1990). The perspective of resource dependence is particularly useful for capturing the interdependencies created by exchange relationships between hospitals and HMOs or PPOs.

Resource dependence focuses on the nature and effect of exchanges a focal organization will enter into with others in its environment to obtain resources necessary for survival. In gaining access to critical resources, these exchanges typically bind the organization to conditions increasing its dependence on others, while decreasing its institutional autonomy. Hospital affiliations with HMOs and PPOs

through formal contracts establish such an exchange relationship in which hospitals may hope to garner stability in patient flows from those capable of channeling them to other providers. These relationships also draw the hospital into the network's sphere of influence, which can be significant depending on its ability to manage inpatient utilization or re-channel its patients elsewhere.

Research Questions

In evaluating the reasons for and conditions under which hospitals enter contractual exchanges with managed care networks, this study addresses three questions related to the scope and diversity, or frequency of occurrence, in the number of hospital affiliations with HMOs and PPOs:

1. Given increasing emphasis on managed care reflected in the emergence and rapid growth of HMOs and PPOs in the United States, how has the scope of hospital affiliation with these organizations changed over the past decade?

2. Given evidence that hospitals are as likely to initiate contracts with managed care plans entering their markets as the plans are with hospitals, what are the salient hospital and environmental characteristics increasing the propensity for a hospital to initially affiliate with HMOs or PPOs?

3. Given the potential for HMOs and PPOs to ultimately restrict their networks to cost-effective providers, is there a relationship between a hospital's performance, in terms of efficiency, and its propensity for initially engaging in these exchanges?

Rationale for and Significance of the Present Study

This study expands upon earlier research in several ways. First, this study adds to the theoretical understanding of managed care from the hospital's perspective, a perspective that is deficient in the growing literature on managed care. The vast majority of the literature, both empirically-based as well as normative, looks to the affect of managed care on hospital behavior. The literature usually ignores the other side of the equation, that hospitals participate in the decision to affiliate.

This study describes the frequency and magnitude of hospital affiliations with HMOs and PPOs, and how the scope of affiliations has changed over the past eight years. The extent to which the scope of affiliations has changed has not been previously analyzed. This study also extends the current theoretical and empirical body of knowledge by formulating and empirically testing resource dependence-based hypotheses addressing the factors influencing hospitals to enter contractual affiliations with HMOs and PPOs. Finally, this study adds another dimension for understanding hospital strategies in the 1990s--empirical evidence of the relationship between hospital efficiency and managed care affiliation strategies.

The nature of the exchange relationships between managed care entities and their affiliated providers is becoming increasingly important as government and private purchasers promote delivery systems that can be compared on the basis of price and ability to cost effectively "manage" the care process. The Administration's promotion of "managed competition" reflects the growing need for understanding the scope and

effect of exchange relationships with managed care networks such as HMOs and PPOs because that understanding is so critical to the strategic decision-making by hospital management and public policy makers alike. The criticality of these relationships is evident in the continued belief that managed care networks may be more capable than government fiat in identifying and managing cost effective providers, especially with respect to the largest component of health care services, hospital care.

Overview of the Remaining Chapters

Chapter 2 synthesizes and critiques the literature related to the interests served by, and risks of, hospital affiliation with managed care networks. This review summarizes the available evidence of the changing scope of hospital affiliation with HMO and PPO networks, and the determinants associated with affiliation. The chapter summarizes deficiencies in the existing body of knowledge, and the need for additional research.

Chapter 3 develops the resource dependence theoretical perspective, and presents empirically testable hypotheses using the generic term "distribution channel agents" (DCAs) to cast the collective similarities of HMO and PPO networks from the hospital's perspective. A model is proposed for predicting hospital DCA selection strategies considering the two critical dimensions of autonomy and resource need.

Chapter 4 presents the research design, data sources, variable measurements and statistical analyses used in this study to examine hospital-DCA relationships.

Chapter 5 presents the empirical results of this study. Descriptive statistics and results of the non-parametric and multivariate analyses are provided. Chapter 6 summarizes and discusses the key findings of this study and the extent to which new information has been developed to better understand hospital affiliation with managed care organizations. Methodological assumptions and study limitations are also noted. Chapter 7 presents the conclusions reached in this study, their implications, and offers directions for future research.

CHAPTER 2
LITERATURE REVIEW

This chapter assesses the current literature to define and specify, from the hospital's perspective, managed care networks in general, and HMOs and PPOs specifically. The literature is then examined to identify the attributed benefits and risks hospitals must consider in affiliating with HMO and PPO networks. The review then synthesizes the available evidence specifying the extent to which hospital affiliation with networks has changed since the early 1980s. Lastly, empirical evidence of the factors influencing hospital affiliation is assessed, particularly any evidence of determinants related to hospital efficiency.

Managed Care Networks

The emergence and diffusion of managed care networks has threatened the financial stability of hospitals, and, ironically, offered a means for financial stability in an increasingly buyer-dominated environment. An increasing array of organizations have entered into the health care arena in response to public and private purchaser demand for expanded choice of provider forms and increased accountability and predictability (Boland, 1991). Generically referred to as "pro-competitive" (Brown &

McLaughlin, 1988), support for these organizations has been based on the argument that by removing regulatory barriers inhibiting a competitive system, more efficient delivery systems could enter the health care market to increase consumer choice and directly, as well as indirectly (a "spillover" effect), provide better value for the cost (Christianson & McClure, 1979; Enthoven, 1990; Enthoven & Kronick, 1989a, 1989b; Luft, 1980).

From the hospital's perspective, the newer organizations present two different threats. Some organizations threaten hospital dominance by offering alternative means and settings to inpatient care, such as ambulatory surgical centers and home health care agencies. Hospitals have responded by expanding into non-inpatient services (Goldsmith, 1988), and offering purchasers a broader spectrum of services through interlocking networks with physicians, as in the case of physician-hospital organizations (PHOs) and medical-staff hospital organizations, or MeSHs (Greifinger & Bluestone, 1986). These joint ventures between hospitals and physicians serve to stabilize referral patterns and the associated patient volume (Harris, Hicks & Kelly, 1992).

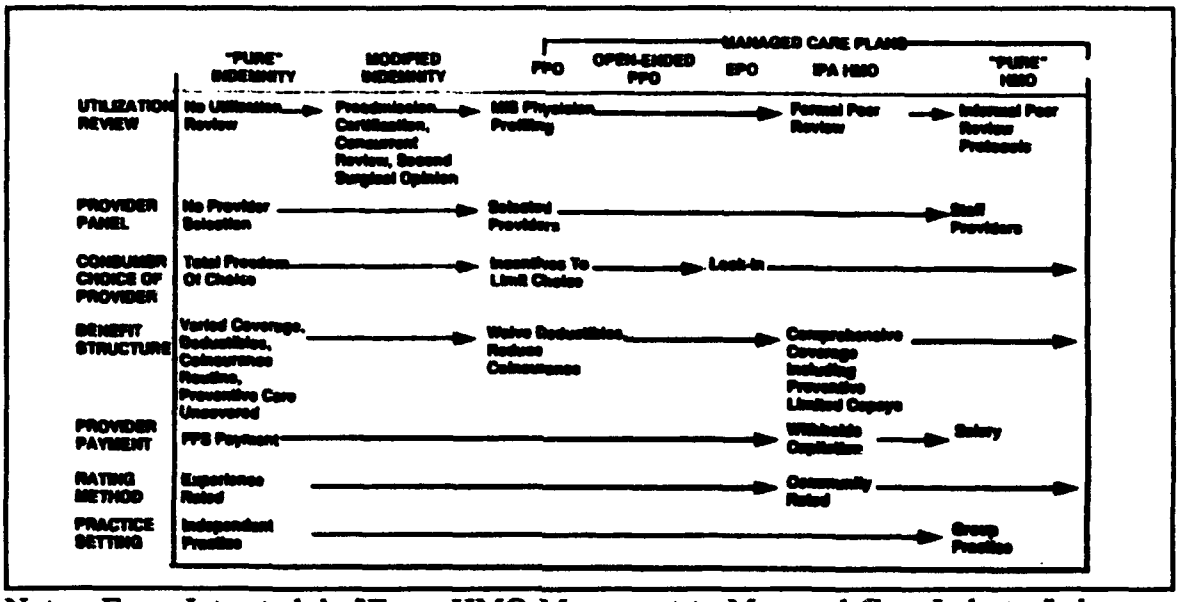
Hospitals are also threatened by organizations designed to "manage" provider services utilization to extract more control, predictability and accountability (Brink, 1986). The new health care financing and delivery entities offer purchasers of care choice from a broad spectrum of activities designed to influence hospital behavior. Some organizations help purchasers administratively manage their benefits programs through activities such as data and claims management, third-party administration and

other administrative services (Higgens & Meyers, 1986; McDonnell, Guttenberg, Greenberg & Arnett, 1986). Others have expanded earlier utilization review mechanisms (Institute of Medicine, 1989), motivated by claims of reduced inpatient utilization at a fraction of administrative implementation costs (e.g., Feldstein, Wickizer & Wheeler, 1988; Wickizer, 1992). These utilization management (UM) techniques have increasingly intruded into the provider-patient relationship to identify inappropriate or excessive care (Hurley & Bannick, 1993), and have been incorporated by conventional health insurance plans as well (Christianson, 1988; Sullivan, Miller, Feldman & Dowd, 1992). Finally, other "managed care" organizations have promoted their capacity to serve as the buyer's accountable agent by accepting payment arrangements in advance of providing a pre-determined level of services. These network-based, negotiated fee organizations may combine the advantages of UM oversight with a limited network of various providers selected for their willingness to accept practice constraints and other conditions. Hospitals and other providers are induced to join these networks and accept practice constraints in exchange for potentially greater surety of patient volume.

The array of new financing and delivery organizations, collectively known as "managed care" plans or "alternative delivery systems" present purchasers and consumers significant choice for managing health benefits plans, as well as increasing confusion as to their distinctive attributes (Weiner & deLissovoy, 1993). Definitional confusion in classifying practices as "managed care" is evident in the disparate results of studies trying to portray the extent of their acceptance by employers. For example,

in two studies of employer insurance programs, somewhere between half and 95% of U.S. employees were covered by at least one form of managed care plan by the early 1990s, depending on the definition used (Sullivan, Miller, Feldman and Dowd, 1992; Health Insurance Association of America, cited in Darling, 1991, respectively). The diversity of managed care practices has been characterized as a continuum of various plan types differentiated by key features. For example, Interstudy (cited in Merz, 1989), depicts a continuum of managed care arrangements shown in Figure 1 in which various purchaser options available for managing care differ in the extent of utilization review, consumer freedom to choose providers and settings, provider payment and insurance rating methods. These options are variously "packaged", ranging from traditional fee-for-service "pure indemnity" plans with no utilization management or provider selection (far left-side of the continuum), to very structured managed care networks labeled as "pure HMOs" on the extreme right (Christianson, 1988; Merz, 1989). This continuum theoretically depicts the potential for increasing control over costs and quality as more options are selected that depart from traditional indemnity insurance. It also suggests that the greater the departure from indemnity insurance, the greater the use of controls and accountability, complexity and, perhaps, overhead expenses (Wagner, 1993).

Figure 1. Managed Care Continuum



Note. From Interstudy's "From HMO Movement to Managed Care Industry" by J.A. Hale and M. M. Hunter, June 1988. Reprinted with permission.

Weiner and deLissovoy (1993) similarly present a range of health insurance plans, distinguishing their features along several dimensions. The authors argue plans can be distinguished by the degree to which financial risk for performance is shared by participants in the plan (e.g., sponsors, intermediaries and providers); the use of restrictions for consumers (e.g., choice of providers) and providers (e.g., clinical options); and the degree to which plans are contractually obligated to arrange or provide services.

The Congressional Budget Office (CBO, "The Effects of Managed Care", 1992) contends "managed care" organizations can be better specified by considering only those organizations using interventions designed specifically to eliminate unnecessary and inappropriate care to minimize costs. In the context of this study,

managed care organizations are more narrowly defined using the CBO's classification as those organizations that: (1) limit or influence patients to use an established network of providers; (2) negotiate different payment arrangements with those providers; and (3) review and intervene in decisions by providers with respect to utilization and quality criteria.

Managed care network arrangements are a distinct alternative to traditional fee-for-service health care services. Promoting their services as cost effective and fiscally accountable agents for buyers of health care, their "product" is the ability to satisfy a buyer's specified benefits program (Brink, 1986). They deliver this product by selecting and "packaging" provider arrangements for covered services based on utilization and associated cost considerations. In this capacity, HMOs and PPOs have emerged as the predominant network-based managed care models in the 1990s, competing directly with traditional medical insurance carriers, each other, and independent providers including hospitals (Hoy, Curtis & Rice, 1991).

The vast majority of the literature, both empirically-based as well as normative, looks to the affect of managed care on hospital behavior, ignoring the other side of the equation, that hospitals participate in the decision to affiliate. It is therefore from the hospital's perspective the managed care literature is reviewed next to understand why and under what conditions hospitals affiliate with HMOs and PPOs. The literature review will define and specify HMOs and PPOs, before addressing the known scope of, and factors associated with, hospital affiliations with these networks.

Health Maintenance Organizations

Health maintenance organizations have usually been distinguished from traditional health care indemnity plans that permit covered individuals to choose their providers, and then reimburse the parties after services have been rendered (Gold, 1991a; Wagner, 1993; Wrightson, 1990). HMOs receive payment in advance of members obtaining health care services, and, in exchange for the advance payment, they accept responsibility for providing or arranging for the provision of services specified in the health benefits program. HMOs therefore promise a specified level of services, irrespective of their utilization, rather than simply indemnifying members for the costs of care. By accepting payment for promised services prior to members utilizing them, HMOs assume significant risk for their members' care (Luft, 1988; Rossiter, 1987). HMOs also do not usually require members or providers to file claims for services provided within the network.

All HMOs must ensure a range of providers are available to its members to satisfy the service benefits of purchasers. Services are either provided by HMO provider staff, or are contractually arranged. Contractual arrangements result in networks of various providers, including hospitals. Because HMOs assume the risk of care for their members, they are often characterized as aggressively using substantial mechanisms for motivating enrollees to use network providers rather than seeking care elsewhere, and constraining excessive provider utilization (Hillman, 1991; Hillman, Pauly, Kerman & Martinek, 1991; Hillman, Pauly & Kerstein, 1989; Homer, 1986;

Welch, 1990). These mechanisms involve a wide range of controls, financial incentives and risk sharing designed to align the behavior of enrollees and providers with the plan's objectives.

Hospital contracts with HMOs for inpatient services reflect the diversity of the mechanisms that may be used in the reimbursement methodology. Payment methods may be based on straight charges or discounts from charges as well as sliding scales for charges and discounts, per-diem rates, percentages of patient volume, case rates (ranging from specified services to DRGs) and even capitation in which a monthly payment is made to a hospital per enrollee, irrespective of how much inpatient care is provided (Feldman, Dowd, McCann & Johnson, 1986; Kenkel, 1991; Kongstvedt, 1993; Kralewski, Wingert, Feldman, Rahn & Klassen, 1992). In contrast to the diversity in payment arrangements for inpatient services, payments for hospital-based outpatient services typically use percentage discounts (Boland, 1991).

HMOs have developed and thrived in the face of substantial opposition from organized medicine since 1929, the year often cited for the emergence of two different HMO-like organizations in the United States (Christianson, Wholey & Sanchez, 1991; MacLeod, 1993). This opposition stemmed from two principal sources: physicians' concerns that such prepaid arrangements violated accepted professional norms of practice (Starr, 1982), and by hospital administrators fearing the threat of reduced admissions (MacLeod, 1993). But HMOs have overcome much of the opposition, increasing from 12.5 million members in 1983, to almost 42 million Americans by the end of 1992 (Group Health Association of America, 1993). Total membership in the

546 HMOs represented 16% of the nation's population and almost 19% of those insured in 1992. About 3 million of these members were funded through the Health Care Financing Administration (HCFA), enrolled in Medicare's (1.35 million) or Medicaid's (1.6 million) prepaid contracts (Wilensky & Rossiter, 1991). By the end of 1992, HMOs were concentrated predominantly in urban areas, and were located in every state except four: Alaska, Mississippi, West Virginia and Wyoming (Marion Merrill Dow, "HMO Edition", 1992).

Preferred Provider Organizations.

Similar to HMOs, PPOs develop networks of various providers to meet the health care needs of patients as defined in the benefits packages required of purchasers such as employers. Unlike HMOs which typically restrict members to network providers and which often use primary care physicians as "gatekeepers" for referring patients to preferred specialists (Hurley, Freund & Gage, 1991), PPOs permit members greater freedom to use providers out of the network, but rely on financial incentives and disincentives to get them to use network providers (Weiner & deLissovoy, 1993). Also, unlike HMOs that promise a given level of services and manage excess utilization by sharing the risk of care with providers, PPOs agree to arrange for those services without fully accepting the risk of excess utilization (MacLeod, 1993). To contain purchaser premium prices, PPOs usually require network providers to discount their charges and accept some form of utilization review.

Although PPOs use negotiated discounts and network providers, they are still more closely related to traditional fee-for-service arrangements than HMOs with respect to relationships with the purchaser and the network physicians and hospitals. Industry advocates promote PPOs as preserving both the concept of fee-for-service and patient choice of physician and hospital, and their relative autonomy from federal and state regulatory control, unlike HMOs (AAPPO, 1991). Also, while most PPOs do not share the risk of managing all care required of an enrolled population, as do HMOs, they result in some transfer of control from purchasers to an agent who has the financial incentive for evaluating care on the basis of price and quality (Dranove, Satherwaite & Sindelar, 1986). By accepting some responsibility for managing care, PPOs continue to be characterized by five elements: (1) a limited number of providers, (2) negotiated fee schedules, (3) utilization review, (4) incentives for members to use network providers, and (5) rapid settlement of claims (deLissovoy, Rice, Ermann & Gabel, 1986; Koch, 1988). Although these features still tend to describe most PPOs, utilization management has not been a universally adopted practice. Almost one-sixth of all PPOs in 1992 (16%) did not monitor or sanction aberrant provider utilization, and, on average, PPOs owned by HMOs spent almost twice as much time on utilization review than the average time spent by all PPOs (Marian Merrell Dow, "PPO Edition," 1992).

Preferred provider organizations gained public recognition as distinct networks in the 1980s, emerging as a competitive response to the burgeoning HMOs (Tibbitts & Manzano, 1984). The first PPO arrangement resembling current forms began in

California in the 1970s (American Association of Preferred Provider Organizations, AAPPO, 1991). PPOs have since grown faster than HMOs in terms of total enrollment and number of plans. The American Hospital Association (cited in Cobbs, 1989) reported that in 1983 there were 115 PPOs in the U. S., with most developed and owned independently by hospitals or jointly between hospitals and physicians. By the end of 1991, the 584 corporate entities operating 978 individual PPO plans had established networks of various providers caring for approximately 85.4 million eligible employees and their family members in every state of the U. S. (Marion Merrell Dow, 1992, "PPO Edition"). Medicare demonstration projects permitted enrollment in private-sector PPOs beginning in early 1989 (AAPPO, 1991). The prevailing ownership of PPOs has changed over the years, such that by 1991 only about 15% were owned by hospitals or joint hospital-physician ventures, while most were owned by insurance companies and independent investors (36% and 22%, respectively). The first PPOs reimbursed hospitals based on discounts from usual charges (Gabel & Ermann, 1985). In 1991, the most common PPO reimbursement methods for hospitals were based either on per diem rates or discounts from charges (AAPPO, 1991).

Benefits and Risks for Hospitals Considering Affiliation

Hospitals must consider the distinctive attributes of HMOs and PPOs to evaluate the extent to which affiliation will meet their institutional needs and influence operations. The critical distinction between HMOs and PPOs rests on the degree of risk each assumes relative to the purchaser, how each transfers that risk to its empaneled physicians and hospitals, and the relative freedom enrollees are given to choose their provider (Wiener & deLissovoy, 1993). For example, by receiving capitation payments in advance of patient utilization, HMOs are said to "absorb prospective risk" (Gold, 1991b) and so compensate by, perhaps, more aggressive utilization management and stricter controls on out of network use. While both network forms are subject to differing external control by local professional societies (Berenson, 1991) and face some barriers to entering particular markets (Cooper & Green, 1991; Lutes & Hastings, 1991; Wellers, 1984), HMOs are regulated further by state insurance commissioners (Miller, 1989; Wrightson, 1991).

The extensive literature addressing the substantial incentive and control mechanisms used by HMOs implies they may be better able than PPOs to direct, or channel their enrollees to network providers. But evidence of the efficacy of either network form in channeling patients has been more anecdotal than empirically tested or proprietary and not available to the general public. A 1990 Foster Higgins survey (cited in Weinstein & O'Gara, 1992) does provide evidence that increased channeling capability in motivating subscribers to use in-network providers may be positively

related to the use of larger financial differentials, or different cost-sharing rates. These findings corroborate an earlier study showing a newly formed employer-sponsored PPO in California could effectively channel patients to physicians with significant cost-sharing differentials (Hester, Wouters & Wright, 1987). Additionally, a study of HMOs determined that the more restricted model forms were able to concentrate patients in low-priced hospitals better than less restricted models (Feldman, Chan, Kralewski, Dowd & Shapiro, 1990). Because PPO members have relatively greater freedom and less constraint in seeking care outside the network compared to their HMO counterparts (Cowan, 1984), PPOs may be less effective in channeling members to their preferred providers (Shelton, 1989). Shelton's (1989) research, for example, indicates PPO subscribers may use hospitals outside the network as often as 50% of the time. Because individuals in PPOs can also seek specialist care directly, whereas HMO enrollees must often be referred by primary care physicians, PPOs also may be less efficient in controlling costs associated with specialty care.

Despite the lack of consistent evidence showing the ability, or desire, of these networks to channel concentrated patient volume to their preferred providers, there remains a considerable body of empirical evidence supporting the contention that HMOs as well as PPOs are capable of directing patients away from hospitals. References to the efficacy of managed care networks have most often relied on studies of HMO performance, and, to a lesser extent, PPO performance which has received much less empirical scrutiny (Finkel 1993; Gabel, Jajich-Toth, deLissovoy, Rice &

Cohen, 1988). Hospitals have seen lower bed days and admissions, for example, given the presence in their markets of HMOs (Luft, 1981; Rossiter, 1991) and PPOs (Gabel & Erman, 1985; Hu, Sullivan & Scheffler, 1992; Zwanziger & Auerbach, 1989). Many of these studies have noted that as inpatient utilization declined, outpatient workload and costs increased. Two studies of HMOs are noteworthy because of their distinction as the only truly experimental designs among the managed care research to date. The RAND Health Insurance Experiments (HIE) of the late 1970s (e.g., Manning, Leibowitz, Goldberg, Rogers & Newhouse, 1984; Manning, Newhouse, Duan, Keeler, Leibowitz & Marquis, 1987) and Medicaid's analysis between 1986 and 1987 (Leibowitz, Buchanan & Mann, 1992) were unique in randomly assigning subjects to comparison groups. In reviewing the available evidence of the effectiveness of any form of managed care, the CBO (1992, "The Potential Impact") cites the RAND studies as one of the few offering conclusive evidence of reducing personal health expenditures, at least for two particular HMO model forms (staff and group models, depicted in Figure 1 on the far right). The CBO ranks these model forms the highest in being the most cost-effective, with PPOs and more loosely structured HMOs the lowest of any managed care form. Finally, while staff or group model HMOs are no guarantee of superior performance, they have the capability to control resource use better than other HMO forms (Enthoven, 1988), and, by extension, PPOs.

Proponents of managed care networks have asserted a number of benefits accruing to hospitals affiliating with either HMOs or PPOs (e.g., Cobbs, 1989; Coile,

1986; Cowan, 1984; Dranove, 1985; Wrightson, 1990). The various attributions are summarized in Figure 2 to characterize, from the hospital's perspective, the distinctive advantages for affiliation. They are each addressed with respect to hospital affiliation with HMOs, PPOs and with either network form.

Figure 2. Attributed Advantages and Benefits of Network Affiliation by Hospitals

SOURCE	FEATURE	HMOs	PPOs	BOTH
Shelton (1989)	Increase predictability of workload by aggressively restricting members' choice	X		
Hurley & Resnick (1993) Kralowski, et al.(1991)	Promote enduring relationships with hospitals using extensive UM and information systems	X		
Dranove (1985)	Differentiate/advertise as "managed care" institution	X (1)	X	
Colle (1986); Johnston (1992b);Wrightson(1990)	Financial Reserves; Financial capability to honor debts from distressed employers	X		
Anderson, et al. (1985)	Conduit for non-inpatient services (e.g. preventive care, educational) and lower collection problems	X		
Cobbs (1989); Cowan (1984); Rice et al. (1987)	Managed Care alternative to other network form	X	X	
Colle (1986); Tanner & Hunt (1986); Herman, et al., 1986	Preserve fee-for-service arrangements, align with managed care, offset other revenue constraints		X	
AAPG (1991)	Minimize external sources of control		X	
Cowan (1984)	Less threatening/more appealing to medical staff		X	
Boland (1991); Cobbs (1989); Colle (1986); Cowan (1984); Dranove (1985); Miller (1985); Rubini (1990)	Maintain/expand patient base, increase predictability, prevent erosion of patient/provider base			X
Conrad & Dowling (1990)	Create synergies by aligning with service array			X
Dranove (1985)	Increase switching costs, maintain reimbursement			X
Frieden (1992b) Johnston (1992b) Anderson et al. (1985)	Expand hospital UM and information systems to better negotiate with purchasers and providers			X
Darling (1991) AHA News (Nov 4, 1991)	Indirectly improve quality by minimizing unnecessary treatment, reduce malpractice exposure			X
Chillingerian (1992); Dranove, et al. (1986); Dranove (1985); Greaney & Sindelar (1987)	Reward/protect efficient hospitals by being in network that avoids or does not renew contracts of inefficient, ineffective providers			X

(1) Although Dranove (1985) attributes to PPOs, this is even more applicable to HMOs.

Affiliation with HMOs

Arguments gleaned from the literature for hospitals affiliating specifically with HMOs suggest that because HMOs exercise more control in restricting enrollees to empaneled providers, the hospital's predicted workload volume might be more attainable than with PPOs (Shelton, 1989). To the extent their incentives are mutually aligned, hospitals might be more likely to receive from HMOs than PPOs supporting expertise in managing their own UM and cost control efforts given their extensive information systems. This advantage is based on findings that, even when HMOs follow opportunistic strategies for gaining hospital discounts, they have helped foster enduring relationships, sometimes at the expense of short term opportunities for minimizing costs (Hurley & Bannick, 1993; Kralewski, Feldman, Dowd & Shapiro, 1991).

Hospitals may market their institutions as different from others by asserting they are cost effective providers as evidenced by their affiliation with managed care networks (Dranove, 1985). Although Dranove proposes this strategy for PPO affiliations, hospitals may be more successful given contractual relationships with HMOs. Following the logic of the continuum of care model shown previously, HMOs of all model types are generally oriented more toward risk-based capitation and provider risk-sharing than PPOs (Rossiter, 1987). The impetus for efficiently providing services, all things being equal, would therefore be greater for HMOs.

HMOs have also received substantial empirical scrutiny over a longer period of time attesting to their ability to reduce unnecessary inpatient utilization. PPOs, however, have received little study (Gabel, Jajich-Toth, deLissovoy, Rice and Cohen, 1988), preserve the volume-oriented fee-for-service structure (Cobbs, 1989) and reinforce provider motivation for offsetting discounts by shifting costs to other payers (Ginsberg & Thorpe, 1992) rather than becoming more efficient. Coile (1986) argues that while PPOs may provide hospitals an initial entry into the managed care arena, they do not stimulate providers or patients to fundamentally change their use of services. Coile further argues that the future success of PPOs in an environment focused on costs requires their becoming more like HMOs .

Because PPOs have usually not been obligated to pay outstanding claims for financially distressed employers (Johnsson, 1992b), hospitals may find HMOs more financially obligated and able to pay hospital debts than PPOs (Coile, 1986). Unlike PPOs, HMOs are regulated for carrying financial reserves (Wrightson, 1990) and might therefore help meet debts in the interest of preserving a desirable relationship.

HMO affiliation may also enhance the hospital's other operations such as stimulating interest in preventive care, educational or health promotion programs; using more ambulatory care and ancillary services; and reducing collection problems (Anderson, Herold, Butler & Kohrman, 1985). Finally, HMOs offer hospitals a managed care alternative to PPOs if unsatisfactory relationships have occurred, depending on the sensitivities and loyalties of admitting physicians.

Affiliation with PPOs

PPOs were promoted in the 1980s as providing a competitive response to the growing market presence of HMOs by offering greater freedom of provider choice but with economic incentives to contain costs better than traditional fee-for-service (Shelton, 1989). As shown in Figure 2, the literature attributes several benefits for hospitals affiliating with PPOs as the managed care network of choice. First, hospital affiliation with PPOs aligns the institution with managed care interests, but allows the hospital to avoid assuming financial risks of the relationship and to preserve volume-oriented and charge-based strategies to compensate for Medicare's prospective payment or other revenue-constraining sources (Trauner & Hunt, 1986). Hospitals desiring to affiliate with a managed care network might minimize the influence of external agencies by contracting with PPOs which are considerably less encumbered with federal, state and insurance regulations than HMOs (AAPO, 1991; Coile, 1986). PPO contracts may be also be less threatening, or may appeal more, to hospital-affiliated physicians than contracts with HMOs, permitting the institution to preserve existing medical staff harmony or promote increased cooperation (Cowan, 1984). Similar to the argument for contracting with HMOs, PPOs also provide a managed care alternative for hospitals having unsatisfactory relationships with other network forms (Cobbs, 1989, Cowan, 1984).

Affiliation With Either Network Form.

HMOs and PPOs collectively represent 124 million enrolled members, or almost one-half of the total U.S. population and two thirds of the 180 million people covered by private insurance. In addition to including a portion of Medicare and Medicaid, membership also includes nearly 1 million Department of Defense beneficiaries (Stern, 1991). While 96% of private payments in 1980 were spent on fee-for-service care with the rest going to HMOs, Berenstein Research (cited by Weinstein and O'Gara, 1992) estimated that by 1990 only 15% went to traditional fee-for-service entities, with the majority going to HMOs (18%), PPOs (24%), and managed fee-for-service arrangements (43%). Almost half of all employees sponsored by their employer's managed care programs are covered either by HMOs (25%) or PPOs (22%) according to the Health Insurance Association of America (cited in AHA News, "Majority of Employees", 1993). Clearly, HMOs and PPOs represent the largest stakeholders in the current market for managed care. These network organizations may control the flow of inpatient volume to designated, or preferred providers. In the face of such control, hospitals and other providers may be expected to compete with each other for inclusion in potentially closed lists of preferred providers, a reversal in a market historically governed and dominated by providers.

From the hospital's perspective, HMOs and PPOs have several features in common suggesting affiliation with either network type might satisfy particular

hospital strategic interests. Affiliation has been most frequently cited as a strategy for maintaining or expanding the hospital's patient base and providing the institution greater predictability in patient volume and revenue (e.g., Boland, 1991; Cobbs, 1989; Coile, 1986). Greater predictability may take the form of hospitals protecting existing patient bases to preclude patients being channeled to other hospitals or alternative delivery systems (Dranove, 1985; Rubini, 1990), or preventing the erosion of existing referral relationships with physicians who may soon join these networks (Miller, 1989). Affiliating with either an HMO or PPO network covering a greater geographic area than the hospital might serve to increase the hospital's geographic market for patients, thereby increasing its patient market and improving workload predictability (Cowan, 1984). Affiliation might even be necessary for market survival rather than market protection, especially for the "underclass hospitals" that must secure these contracts to bolster dwindling operating margins (Irish, 1992). In either the case of market protection or market expansion, surety of patient volume influences other operational factors as well. For example, Rubini (1991) found that Standard & Poor Corporation's bond ratings for hospital performance were positively affected when an existing contract with a network enhanced the institution's market share and profitability, and adversely affected when penetration threatened its operating margin and market share.

While the first cited benefit of network affiliation links the hospital to a purchaser with beneficiaries, the second advantage of affiliating with either form

focuses on the potential synergies created by linking the hospital to other suppliers in a system with, presumably, a broader array of services. Affiliation may complement the hospital's existing referral sources for inpatient as well as outpatient services (e.g., ambulatory care programs and institutional and/or physician subspecialties), or its patient placement capability for rehabilitation, nursing home, diagnostic services, etc. (Conrad & Dowling, 1990).

Affiliation with either form provides a third advantage when viewed as a long term hospital strategy for increasing the switching costs for exchange partners, and thus enabling the hospital subsequently to increase reimbursement during the course of an enduring relationship. By gaining the initial contract, Dranove (1985) suggests providers may be able to increase their price in subsequent periods, forcing the purchaser to either acquiesce to the smaller discount, or to consider two expensive and disruptive counter actions. The purchaser must either respond by switching to other providers, and thereby risking employee discontent, frustration and perhaps their participation; or dropping the contract entirely and losing savings. This strategy therefore capitalizes on purchaser strategies for preserving existing employee-physician relationships whenever possible (Mechanic, Ettel & Davis, 1990).

Hospitals may also use the affiliation process to expand their expertise in collecting and using patient, provider and facility statistics (Anderson, et al., 1985). Development of the hospital's information tracking systems can also be combined with knowledge of employer utilization patterns. This expertise can be favorably employed

in negotiating future contracts with purchasers (Johnsson, 1992b), as well as with providers (Frieden, 1992b).

A fifth advantage of affiliation relates indirectly to enhancing the hospital's effectiveness and quality. That is, to the extent patient volume is maintained or improved in ancillary operations, the reduction of unnecessary inpatient services through utilization management without detriment to the hospital's overall quality may indirectly promote the institution's quality and effectiveness (Darling, 1991). As a result of lower utilization of services, hospitals might also reduce their malpractice exposure (Staff, AHA News, Nov 4, 1991).

Finally, affiliation with either HMOs or PPOs provides efficient hospitals a sixth advantage by rewarding or protecting their cost-effective abilities. For example, earlier proponents of PPOs argued that affiliation could be used to provide a marketing edge for lower-priced hospitals by essentially advertising the validity of their discounted services after scrutiny by price-conscious buyers (Dranove, 1985; Dranove, et al., 1986). This argument may be more appropriately attributed to the extent HMOs and PPOs exercise their ability to contract selectively with efficient hospitals (Hester, Wouters & Wright, 1987; Shelton, 1989) by improving their ability to identify and then exclude providers reflecting unnecessary service utilization and poor quality (Rossiter, 1991). The extent to which networks are reimbursed by capitation payments reflects the degree to which they have accepted risk, and accordingly, face pressures to secure the efficient delivery of services (Rossiter,

1987). As Rossiter notes, risk-based capitation payments resulting from transferring some of the network's risk to its providers further encourages providers to be efficient, and may be a distinguishing characteristic of certain HMO models relative to most PPOs. The ability of these plans to "prune" their networks of inefficient providers offers efficient hospitals a means for developing further what was once, perhaps, a niche market (Chilingerian, 1992). Also, to the extent managed care sufficiently penetrates a market forcing competition on price and outcome, efficient hospitals might be expected to welcome and gain from the increased price competition. If managed care makes the demand for hospital care more price elastic, such that as prices drop suppliers will produce more and purchasers will buy more, presumably from the lower-priced suppliers, then the efficient hospital can respond with lower prices and reap the benefits of increased volume quicker than others (Dranove, et al., 1986). If there is an inefficient hospital in the market competing for the services offered by the efficient hospital which is able to reduce its price for those services, than the likelihood increases that ultimately, the inefficient hospital will either downsize (i.e., reduce its capacity, focus on fewer and more specialized services, etc.), exit, or both, further increasing the efficient hospital's market share.

But not all hospitals have affiliated with HMOs or PPOs; and some may wish they had not. Several investigations, usually based on limited case studies or surveys, have described the many awkward and often mismanaged relationships hospitals held with HMOs and PPOs (e.g., Donker, 1991; Larkin, 1990; Shortell, Morrison &

Friedman, 1990). A synthesis of the literature suggests hospitals should be wary of at least six issues when affiliating with either managed care network.

First, although perhaps stabilizing admissions, many hospitals have found network contracts negatively affected their net income (Rubini, 1990), especially when they did not fully understand the cost implications of new administrative management systems (Donker, 1991; Larkin, 1990). Cowan (1984) warned early in the 1980s that affiliation could drain hospital resources due to increased monitoring, reporting or communication costs. Unanticipated diversion of resources may have been especially prevalent for hospitals required to develop new or more extensive cost accounting systems. Poorly negotiated or unprofitable contracts have threatened debt and credit ratings, and resulted in hospitals assuming greater risk without adequate reimbursement (Boland, 1990). Hospitals may also have failed to anticipate the lengthy period of time required before financially breaking even from the strategy, and the magnitude of shifting technologies and staff orientation toward a more revenue-constrained and perhaps even risk assuming direction (Coyne, 1990). The author suggested breaking even may require as long as eight years.

Another risk to be considered is whether anticipated hospital volume or revenue gains will not be realized if the network's utilization management is effective in curtailing admissions or length of stay. The risk of less than expected volume is greater when the patient population, as in the case of PPO enrollees, may easily seek hospital services outside the network (Cowan, 1984). Larkin (1990) commented in his

limited case studies of Humana and Sentara that Humana used PPOs to attract purchaser employees, and subsequently encouraged the new members to convert to the HMO option to reduce their cost sharing while increasing the plan's control over their utilization. A third and related risk is that patients and their providers may not use the hospital, preferring instead to continue existing provider relationships (in or out of the network). The hospital's geographic market may not be increased as expected.

The decision to affiliate presents hospitals with a fourth, Janus-faced risk. Without affiliation, the hospital's survival may be jeopardized. But with affiliation, the institution's sovereignty in pursuing other activities may be severely constrained if its financial needs become subordinated to the network's, and it is forced to reduce excess capacity to reduce costs (Higgens and Meyers, 1987). Borrowing from Porter (1980) and the economics literature, the fifth concern is that in markets where competing hospitals monitor each other's signals and retaliate accordingly, hospitals might send an unintended cue or signal to their competitors when they affiliate (e.g., signalling possible foreclosure on others). There may be other unintended, but less extreme, consequences as well, such as the loss or discontinuance of existing arrangements (e.g., residency programs with academic medical centers). Finally, while not as much a risk due to affiliation as a potential benefit of not affiliating, hospitals might instead circumvent the "managed care middleman" (Kenkel, 1991, p. 37) by developing their own utilization management expertise in preparation for dealing directly with employers.

Known Scope of Hospital Affiliations

With respect to the first research question, the literature focuses on the extent of current involvement with network affiliations, without offering much evidence as to how this involvement has changed over the past decade as the networks increased in numbers and matured in operational longevity. The majority of the descriptive information related to the extent of hospital affiliations with managed care networks comes from limited survey data or descriptive case studies. These data are usually promoted by industry trade associations or consultants, often with little analysis or explanation of the study methodology.

Industry surveys indicate that, from the plan's perspective, PPOs have increased the number of hospital contracts since 1991, averaging more contracts than HMOs (Marion Merrell Dow, 1992, "HMO" and "PPO" Editions). PPOS may average more contracts with more hospitals than HMOs, in part, due to their forming regional and even national networks to appeal to the multi-state requirements of large employers (Hurley & Luke, 1992). Studies focusing on the hospital as the unit of analysis similarly indicate hospitals have increasingly affiliated with managed care plans, often with multiple entities. In the mid-1980s, hospitals belonging to the California Hospital Association contracted with an average of 4 PPOs, while larger hospitals in San Francisco with over 300 beds contracted with between 30 and 50 PPOs (Trauner & Hunt, 1986). These numbers may no longer be relevant given the

quadrupling in HMO and PPO membership over the past eight years, and the fact that California has been the most highly penetrated managed care state in the nation.

A more recent national survey by the American Hospital Association (cited in Friedman, 1993) indicates that by 1990, almost half (48%) of all hospitals contracted with HMOs. Friedman does not specify the study methodology, nor indicate the sample size or participation rate of hospitals. Referencing this same study, Framer (1993) notes that most of these affiliations are formally negotiated contracts between hospitals and HMOs, with only 14% sponsored by the hospital. Kenkel's (1991) limited survey of 96 hospitals lends support for the conclusion that the hospitals that do affiliate with managed care, do so through multiple contracts. The author finds the average hospital contracted with 16 HMOs, PPOs and other managed-care entities, receiving as much as 50% of its non-government contract business from these networks.

A national questionnaire-based survey of U.S. community hospitals by Deloitte and Touche (1992) found hospitals have increasingly contracted with HMOs (70% of those surveyed) and PPOs and other managed care entities (78% of the respondents). The survey also found that hospital affiliation has varied significantly by region and population concentration, and has not been a universally accepted strategy. With 1,363 hospitals responding (or 26%) of nearly 5,400 surveyed, the report found that a significant number of hospitals did not affiliate with HMOs (1 out of 3) or PPOs and other managed care entities (1 out of 5). Affiliations were greatest in the Pacific,

Mountain and New England regions, with hospitals in all regions expressing greater likelihood of affiliating with PPOs or other managed care firms than with HMOs. Rural hospitals were also more likely to affiliate with PPOs than HMOs. Hospitals receiving at least 10% of their patients from these networks were twice as likely to report PPOs as the source than HMOs. Survey findings also supported conclusions reached in the Trauner and Hunt (1986) study that larger hospitals were more likely to contract with one or more HMOs or other managed care plans.

In summary, the literature shows that a high percentage of hospitals are currently affiliating with HMOs and suggests, from anecdotal evidence, that this percentage is higher than in the past. Certainly the evidence presented earlier related to the growth of HMO and PPO networks would imply more hospitals are affiliated. Unfortunately, little empirical information is available in the public domain responding to the needs of this study's first research question. Information is lacking to appreciate how affiliation activity has changed over the past decade as HMOs and PPOs have matured and increased their market presence.

Factors Influencing Hospital Affiliations With Networks

With respect to the second research question of the present study, the survey literature also provides some information useful for developing a rudimentary, but limited, profile of the typical hospital affiliating with managed care networks. That

is, the preceding information suggests that size, urbanization and regional location are associated with greater affiliation activity. These data do not, however, yield information as to if and to what extent that profile has changed over the past decade, nor does it provide information as to which hospitals have not affiliated with these networks. Other studies add somewhat to understanding the factors influencing hospital affiliations with HMOs or PPOs, and less to understanding the relationship of hospital efficiency and affiliations (the third research question).

Factors Influencing Affiliations With HMOs

In comparing the factors affecting differential growth of HMOs in two SMSA market areas (Minneapolis-St. Paul and Chicago), Anderson, Herold, Butler, Kohrman and Morrison (1985) found the nature of hospital competition a distinguishing feature enabling HMO development. Using longitudinal data from the 1950-1980 period, interviews with key market leaders and HMO case histories, the authors characterized the Minneapolis-St. Paul hospital market in the early 1970s as one of high bed capacity and service utilization but with low occupancy rates, whereas Chicago had low capacity and utilization and also high occupancy. They concluded that while HMOs emerged in both markets at about the same time, those in the Minneapolis-St. Paul market grew faster in numbers and membership size than those in Chicago. The authors argued the Twin Cities hospitals fostered HMO development because they had

transitioned from competing for physicians by offering more services to competing for purchasers on the basis of price.

Using the hospital-HMO contract as the unit of analysis, a series of published cross-sectional studies have provided several key insights into the factors associated with hospitals formally affiliating with HMOs. Kralewski, Countryman and Shatin (1982) determined from a structured interview survey of 27 hospitals and 7 HMOs in Minneapolis-St. Paul that hospitals initiated many of the 20 interorganizational contracts examined in 1980. Two factors were found to be most influential in determining the degree of risk sharing in the contracts: the ability of the HMO to concentrate sufficient numbers of patients in a given institution, and the hospital's capacity and incentives for participating in an exchange agreement. The hospital's capacity was influenced by the degree it had excess beds or unused services, while incentives for undertaking an agreement included the presence of an equally accessible hospital in a service area with low occupancy rates, and the potential for retaining or improving market share.

Kralewski, Countryman and Pitt (1983) also concluded from structured survey responses in 1981 from 30 hospitals and 7 HMOs in Minneapolis/St. Paul that HMOs selected hospitals for primary and secondary services on the basis of location and service availability without concentrating patients. The authors found that, for tertiary care services, however, HMO control over patient flow, price and quality became more significant bargaining issues.

Kralewski, Doth, Rosenberg and Burns (1983) found, contrary to their expectations, that as HMOs became larger and operated over several years, they did not necessarily concentrate their membership into a more limited set of contracted hospitals. The analysis of survey responses in a national sample of 46 HMO plans (42% of the total sample) revealed these plans did not concentrate their inpatient use in fewer hospitals because of the overriding need to provide convenient access for their larger and more diverse membership. The survey also generally indicated that hospital selection into HMO networks was usually based on the hospital's location and availability of particular services or specialists, and less on the hospital's reputation, willingness to cooperate, available beds and price. HMO selection of hospitals initially on the basis of factors other than price was corroborated by Johnson and Aquilina (1986) in their pooled, cross sectional, time series analysis of hospitals in Minneapolis-St. Paul covering the period 1977-1982. The authors, while acknowledging how much the managed care market had changed nationally between the end of their study and the year of publication, also emphasize the relevance of their study to the mid-1980s because the Twin Cities reflected a 25% HMO presence at a time when it was only 6-7 % nationally. Feldman, Kralewski, Shapiro and Chan (1992) also found that price was not a significant factor in hospital selection in their 1985 analysis of six HMOs in four large metropolitan areas managing 102 hospital contracts. Feldman, et al. did find, however, that price and payment methods were often changed during subsequent contract renegotiations with the same hospital. This

finding indicates attention to price becomes more focused as HMO-hospital relationships mature over time. The authors also noted that while contracts in the four areas studied may have been initiated as frequently by hospitals as HMOs in the late 1970s and early 1980s, by the mid 1980s most were either initiated by the HMOs, or jointly by both parties.

In a 1987 case study analysis of four HMO markets, the HMOs claimed to know as much or more about the target hospital's cost structure than the hospital's management (Kralewski, Feldman, Dowd & Shapiro, 1991). HMOs reported they did not hesitate to challenge unfavorable pricing structures. They also acknowledged that the relationships between the plan and its physicians often dictated how the plan would negotiate contract arrangements with the hospital. While often capitalizing on short-term opportunities for obtaining favorable financial concessions from hospitals, successful mid-sized HMOs were also found to extend efforts to improve the efficiency of participating hospitals to increase their financial viability, which in turn helped to promote enduring relationships. Successful HMOs expressed the desire to avoid operating their own hospitals, preferring instead to assist competent hospitals in maintaining their economic viability. This finding supports the argument that affiliations with HMOs might accelerate a hospital's managed-care learning curve which could then increase its efficiency in related, as well as unrelated activities.

Extending previous research on hospital-HMO contracts to an AHA survey-based sample of 801 hospitals, Kralewski, Wingert, Feldman, Rahn and Klassen

(1992) used resource dependence-based hypotheses to identify the factors and conditions motivating hospitals to offer HMOs discounts. The authors concluded that while hospitals preferred to retain their autonomy by avoiding contractual relationships involving discounts with HMOs, the criticality of patients as their primary resources required them to sacrifice this independence by contracting with HMOs capable of providing those resources, and offering discounts to stabilize existing sources. The authors argued that hospitals would more willingly negotiate discounted contracts with HMOs as the need for, and scarcity of, resources increased. The authors used occupancy rate (showing the degree of excess bed capacity) and expenses per patient day relative to others in the market to measure a hospital's need for resources. Scarcity of market resources was represented by the number of hospitals in the market that could compete with the focal hospital for access to the HMO patients. Given their finding that most hospitals did not obtain volume guarantees from the HMOs, the authors postulated that either the HMOs possessed greater bargaining power, or the hospitals considered the contract alone sufficient to make the HMO resource dependent on their inpatient beds. Public hospitals, at least in one part of the analysis, appeared less willing or able to offer discounts. This study also found the magnitude of hospital discounts was positively related to HMO enrollment, but not significantly related to the number of plans.

Extending the information gleaned from the studies by Kralewski and colleagues to the needs of this research, it would appear that the first hospitals linking

to an HMO in a particular market may do so without a sense of long term commitment to the particular HMO. But they may affiliate for two countervailing reasons: (1) as an immediate attempt to garner any and all patient volume available, and (2) as a strategic move to evaluate future possibilities for more enduring relationships and/or to position their institution for the future by developing their internal capabilities for managed care. Hospitals in the former category may be financially distressed, or moving in that direction with substantial excess capacity relative to others. A poorly performing hospital that affiliates with an HMO may therefore not improve its position if the plan does not subsequently concentrate its patient workload in that hospital. Hospitals in the latter category might be more farsighted and proactive relative to their contemporaries in the market, which might also be reflected in better current performance than their peers. This latter argument positing hospitals attempt to improve their performance by building a managed care "learning curve" is somewhat contradicted by the commentary that while HMOs "think and act strategically," hospitals "rarely had a strategy for dealing with HMOs" (Kralewski, et. al, 1991, p. 9). But the authors do not expand on this insight.

Factors Influencing Affiliations With PPOs

In their study of the effect of Medi-Cal's PPO contracts on California hospitals surveyed in 1983 and again in 1985, Trauner and Hunt (1986) found several key hospital attributes were related to the likelihood of obtaining contracts, that such contracts seldom resulted in employees changing their hospital-use patterns, and that, initially, most participating hospitals did not see major shifts in volume as a result of the contract. With respect to hospital attributes, the authors found hospital bed-size, not-for-profit status, university teaching status and urban location positively related to the number of PPO contracts. The authors attributed the failure in obtaining contracts by smaller hospitals (i.e., having less than 200 beds) due, in part, to their limited service mix. In looking only at nonteaching hospitals, the authors found the number of contracts was positively related to a hospital's number of beds and occupancy level, and negatively related to per diem charges and percentage of Medi-Cal patients.

Based on the findings from their follow-up survey in 1985 of over 2,000 PPO contracts with 248 hospitals, combined with anecdotal reports from regional PPO staff, Trauner and Hunt also concluded that PPO sponsors did not drastically alter existing use patterns among local hospitals. The authors argued that PPOs specifically attempted to identify and then contract with those hospitals found historically most acceptable to employer work forces. This conclusion lends support to the argument that PPOs may preserve existing fee-for-service arrangements.

Similar to the Kralewski, et al. (1992) study of hospital contracts with HMOs, Trauner and Hunt (1986, p. 33) noted that "Initially, most hospitals failed to see major shifts in volume as a result of PPO contracting." The authors did not offer empirical evidence to support this contention, but they did note their surveys may not have allowed sufficient time to elapse for adequately determining the positive or negative effects of PPO contracts on California hospitals. The surveys also may no longer adequately reflect the extensive presence of HMOs and PPOs in California, nor the extent to which hospital volume has become more reliant on the presence of managed care arrangements.

In their case study of a single employer-sponsored PPO in California over the 1982-1985 period, Hester, Wouters and Wright (1987) concluded that while the network did not reduce aggregate costs to the employer (e.g., average annual charge per member) because of its small proportion of membership relative to all employees, the PPO was successful in using substantial discounts to channel members to designated outpatient providers, but ineffective in channeling to preferred inpatient services. Using computerized claim and eligibility data combined with employee surveys, the authors determined that weaker employee discounts for using designated inpatient providers, recurring problems in provider compliance with the PPO's utilization review and channeling programs, and enrollment by relatively healthy employees contributed to the failure of the PPO to effectively channel patients to preferred hospitals. In addition to the low proportion of PPO membership relative to

total employees, these factors also confounded any substantive inferences about the cost effectiveness of the PPO.

In focusing on the factors associated with hospitals bidding for, and offering discounts in contracting with a Blue Cross-sponsored PPO in Indiana, Staten, Umbeck and Dunkelberg (1988) found in their multivariate analysis of cross-sectional data that the number of competing hospitals in the county-level market area and the availability of unused beds were significant predictors of the probability a hospital would bid for the PPO contract. The authors did not find the PPO's market share to be a significant predictor. In an earlier study (Staten, Dunkleberg & Umbeck, 1987), the authors found that the size of hospital discounts offered in the PPO bid were also positively related to the number of competing hospitals in the market. The studies have been subsequently criticized for using initial bid prices rather than final contracted prices, (Allen, 1992; Pauly, 1988), and examining a newly formed PPO without allowing sufficient lag time for mutual learning and adjustment (Melnick, Zwanziger, Bamezai & Pattison, 1992). The studies were also criticized for relying on the county-level measure of a hospital's market, as arbitrary and not adequately descriptive. Notwithstanding these limitations, the studies indicated that the size of PPO contract bids decreased as the number of hospitals in the county increased, and that same relationship did not hold with respect to the availability of excess hospital bed capacity.

The Melnick, et al. (1992) multivariate analysis of contracts in 1987 between

190 California hospitals and a single Blue Cross PPO also found support for the argument that increased hospital competition (measured by discharge-based Hirschman-Herfindahl Indexes) led to lower negotiated prices, while higher negotiated prices resulted when the hospital was a critical to the network (based on the hospital's share of total Blue Cross days in its market). The authors also found that while neither the hospital's occupancy rate nor the average occupancy of the market based on patient origin were significant predictors of the contract price, the interaction of these two variables was. The authors argue this interaction variable (equal to 1 if the average of both the hospital and market occupancy rates is greater than 75%, and 0 otherwise) reflects how hospitals with high occupancy rates operating in markets with little excess capacity (high average occupancy) are able to negotiate higher prices from the PPO. In comparing the two approaches used to define a hospital's market area, the authors contend the lower coefficient values found for the county-level measurement relative to the much higher coefficients found for the zip-code based measurement reflect how county-level data underestimate the price-influencing effects of market conditions, especially in markets where mergers have occurred.

In their analysis of 58 Blue Cross plans, Hu, Sullivan and Scheffler (1992) corroborate previous findings that hospitals with lower excess capacity are less likely to participate in PPO arrangements. The authors did not find a comparable relationship between hospital occupancy rates and HMO participation.

Summary and Conclusions

The literature on hospital development through critical changes in the environment reveals that hospitals have been highly resilient institutions in shaping as well as reacting to their environment. They have adapted to the financial incentives for developing capacity and enhancing predictable patient volume to use that capacity. The literature also suggests hospitals continue to be faced with challenges in a profoundly new environment.

In the earlier phases of their development hospitals could differentiate their services on the basis of technology, community service and ambiguous measures of quality. Hospitals in the 1990s, however, are under pressure to defend their service delivery based on a medium of exchange corporate America is quite familiar with, i.e., price. Network-based organizations such as HMOs and PPOs have entered the fray, openly bidding for purchasers on the basis of price, and promising accountability in managing the behavior of their preferred providers for maintaining quality and containing purchaser's health care costs.

The literature also shows that managers and policy makers still know little about how hospitals have responded to these networks over the past decade. That is, despite the critical role of hospitals in our health care system, the extensive development of managed care networks such as HMOs and PPOs, and the current public policy debate emphasizing network-based managed competition as a means for reforming health care, there is limited information to discern which hospitals have

affiliated with which network types or not affiliated at all. Further, there is a dearth of information on what factors appear associated with particular affiliation strategies, especially hospital efficiency.

With respect to how the scope of affiliations has changed over the past decade (this study's first question), the literature does suggest hospital affiliations with these networks have increased, at least by showing the extent of current affiliations, and then presuming growth through anecdotal evidence. That is, by 1990 almost half (48%) of all hospitals contracted with HMOs (Friedman, 1993), while 70% contracted with either HMOs or PPOs (Deloitte & Touche, 1993), but little is shown to indicate the extent of these affiliations before the 1990s. These contracts predominantly reflect negotiated bilateral exchange relationships between independent entities (86%), rather than arrangements between parties already bound through common ownership (Fraser, 1993). The limited evidence, usually based on surveys, indicates PPO affiliations have increased more than HMO affiliations since the early 1980s, and are expected to increase in number in the foreseeable future. Hospital affiliations reflect wide geographic variation, with the greatest proportion of affiliations with HMOs and PPOs occurring in the Pacific, Mountain and Northeastern areas. Hospitals [illegible] increasingly affiliated in rural areas as well, especially with PPOs, alth[illegible] have thrived predominantly in highly populated urban areas.

While the literature offers a number of reasons for affiliation with HMOs and PPOs, the paucity of empirical evidence provides little in the way of profiling which

types of hospitals affiliate with which networks. Such profiles would underscore the relative influence of particular factors on affiliation strategies (the second and third research questions of this study).

Evidence of the influence of specific factors on affiliation strategies most often is provided from limited surveys, or empirical studies involving cross-sectional data, usually in the early to mid-1980s. There is some limited but inconclusive evidence as to the influence of hospital ownership: the Kralewski et al. (1992) study suggests **public hospitals** might be less likely to affiliate with HMOs, while Trauner and Hunt (1986) indicate **not-for-profit status** may be positively related to PPO affiliations. The greater a **hospital's range of services** the more likely it will receive patients channeled by the PPO (Hester, et al., 1987) or bid for a PPO contract (Trauner & Hunt, 1986), while the higher its **market share** the less likely it might affiliate with a PPO (Staten et al., 1987 and 1988).

Without distinguishing the type of network with which the hospital might likely affiliate, the evidence does suggest three factors consistently contribute to a hospital's willingness to affiliate. These factors are the extent to which the hospital has **excess capacity** (usually measured by occupancy rates), the **presence of competition** in the market (often measured by the number of similar hospitals in the market or a measure of market concentration such as the Hirschman-Herfindahl Index), and its **size**. Larger hospitals, as measured by their number of beds, may tend to contract with more than one PPO (Trauner & Hunt, 1986), or with more than one network form

(Deloitte & Touche, 1993).

Although the literature consistently cites the mandate for HMOs and PPOs to limit their networks to cost-effective providers, the prevailing body of knowledge is silent on this issue. Analyses have instead focused on the extent to which HMOs or PPOs can directly, or indirectly, reduce costs in their markets. This latter issue, of identifying and selecting only efficient providers has not been seriously evaluated to date, yet has been fundamental to the expectations of managed care, and usually a definitional characteristic of both network forms.

The extant literature reveals a number of methodological and substantive issues that should be addressed in future research. Methodologically, most of the literature on affiliations provides evidence for the influence of factors based simply on surveys. Other empirical studies have relied on single case studies or limited samples, and, more often than not, used cross-sectional data with little support from longitudinal analysis.

Substantively, the findings of this review suggest at least three key issues should be considered. First, descriptive analyses with the hospital as the unit of analysis are conspicuously absent with respect to the nature and market environment of hospitals choosing to affiliate, or not to affiliate, with HMOs or PPOs. The absence of such studies, or the limitation of the few to singular markets or points in time, should be of concern to policy makers given the continued dominance of hospitals in the country, and their diversification into non-acute settings.

The literature also points to the need for scrutinizing the factors influencing hospital linkages with managed care. Are these developments reflective of proactive and insightful strategic planning and marketing efforts by, perhaps, efficient and thriving hospitals, or, the last ditch responses by hospitals hovering on the brink of collapse? Since exchange arrangements are bilateral, this question can be approached from either the hospital's or the managed care's perspective. The evidence suggests pursuing the hospital's perspective is clearly warranted because hospitals sponsored many of the earlier HMOs and PPOs, and, while deferring that role to others in recent years, they have often been found to initiate many of the negotiations leading to network contracts, at least with HMOs.

The third consideration rests on the need to validate the acclaimed assumption that managed care networks will, or must, affiliate with efficient providers. There are no studies reflecting the extent to which hospitals contracting with either network form are more or less efficient than non-contracting hospitals, or that hospitals contracting with one network type are different than those contracting with another type.

In conclusion, the prevailing literature on hospital affiliations with HMOs and PPOs insufficiently answers the three fundamental questions raised by this study. How has the scope of hospital affiliation with these networks changed over the past decade? What factors have contributed to the propensity for hospitals to initially engage in these contract relationships? And lastly, to what extent, if at all, does the hospital's efficiency contribute to affiliation?

CHAPTER 3
CONCEPTUAL FRAMEWORK: RESOURCE DEPENDENCE

The frequency and magnitude of external pressures for change since 1983 indicate the hospital industry is undergoing a crucial transition. Former turmoil due to constraining regulation or alienated professional groups pales to the converging forces propelling hospitals into a new health care order. Hospitals are being forced to reconsider their previous revenue generating strategies as managed care networks like HMOs and PPOs threaten to redirect or re-channel existing patient and revenue flows. In 1993, hospitals face dire uncertainty over the stability of critical resources without which they cannot survive-- patients, physicians and monies (Alexander & Morrisey, 1989) necessary to support their extensive service and technology infrastructure. The magnitude of this uncertainty is tantamount to earlier frontier communities apprehensive about the railroad bypassing their towns. Uncertainty as to where selective contracting by large networks like HMOs and PPOs will leave them places hospitals in the 1990s at an historic juncture, to serve as a station along the network's lengthy "rail lines", or to gamble their exclusion will yield a thriving metropolis, and not a ghost town.

Robinette (1990) contends hospitals in the 1990s must adapt to a fundamental "paradigm shift," in that they are no longer viewed as charitable trusts where their costs would be underwritten, but instead have been forced into the role of seller of

services to purchasers for whom costs do matter. Hospitals are aggressively searching for strategic "fit" in an uncertain and rapidly shifting environment- an environment which has been portrayed as hostile (Relman, 1991) and ubiquitously labeled as turbulent (D'Aunno & Zuckerman, 1987; Ginn, 1990; Shortell, Morrison & Friedman, 1990).

Emery and Trist (1965) first defined a turbulent environment as one characterized by extreme uncertainty due to dynamic, fundamental change arising from and within the interrelationships among organizations, as well as their relationship to the economic and other facets of the society at large. Three factors contributing to the dynamic change in the "ideal" turbulent environment are: (1) the linkage of large numbers of organizations stimulating indigenous changes in the environment; (2) legislative and regulatory forces affecting economic operations; and (3) industry reliance on research and development to enhance competitive capacities (Emery & Trist, 1965). Although the environment exerts selective pressure on the "fittest," the focal organization can learn and adapt to meet the changing contingencies even as other organizations gain importance relative to it (Terreberry, 1968).

Recent events in the hospital environment provide convincing evidence the first two factors contributing to a turbulent environment have already occurred. Certainly legislative and regulatory forces have persistently influenced the economic "playing field" for hospitals since at least 1965, subsequently changing the rules of economic engagement across the nation beginning 1983 with PPS. The explosion of

alternative organizational structures and the dramatic surge of network building by providers, intermediaries and purchasers have similarly contributed, and responded to, indigenous environmental changes. Finally, the health care literature of the past decade corroborates Emery and Trist's (1965) argument that industry reliance on research and development to enhance competitive capacities presents the third contributing factor. While purchasers experiment with direct contracting and self-funding health benefits programs and networks such as HMOs and PPOs experiment with product line diversification and hybridization, hospital services are emigrating to ambulatory settings.

Stevens (1989, p. 353) notes in her treatise on the historical development of the American hospital industry that:

> ...as a largely private industry it has been enormously successful. Throughout the century hospitals have responded ... to the demands of purchasers and to opportunities for income and capital acquisition. The hospitals' essential ambiguity of purpose and adaptability to changing environmental pressures, particularly to monetary incentives, have enabled them to maximize their financial opportunities, expertise and technique.

Stevens' conclusions reflect the remarkable ability of hospitals to adapt to, and influence, their changing environment. Their adaptation has often involved strategies of affiliation with other organizations and interests. Hospitals establish cooperative arrangements with other organizations for a number of reasons, but presumably for the

purpose of improving their performance in some manner, such as for gaining resources, distributing their services and performing other functions (Badarraco, 1991). In developing cooperative arrangements with other organizations, the classic organizational focus on a hospital's internal structure and processing activities can shift to how the hospital interacts with its environment (Kaluzny & Hurley, 1987). The view of organizations as "open systems" wherein they are influenced by and also capable of influencing their environment (Scott, 1987) underscores the relational context, or "interconnectedness," of organizations and their environment. This "interconnectedness" refers to the phenomenon where an organization's survival and performance often depend on critical linkages to other organizations (Oliver, 1991). These linkages offer participants a means of enhancing the respective strengths and surmounting the individual weaknesses of participating organizations (Powell, 1987).

Hospital performance in interorganizational relationships can be viewed and understood from a resource dependence perspective that considers how organizations acquire, rather than use, resources to maximize access to those resources while minimizing the loss of their autonomy (Kaluzny & Hurley, 1987). Hospitals have pursued many such interorganizational arrangements, historically relying on the advocacy and policy articulation of their national and state trade associations (Starr, 1982; Stevens, 1989), but more recently including strategic alliances, equity partnerships, joint ventures, research or purchasing consortia and many others. While Griffith (1992) argues a narrower perspective in labeling HMOs and PPOs as merely

"payment partners" in the open systems environment of hospitals, this study emphasizes a much broader relationship. Contractual affiliations with HMOs and PPOs establish a highly reciprocal relationship in which the hospital provides needed acute inpatient and other services while attempting to secure stable patient and financial flows from a network that might be capable of channeling those flows elsewhere. From the hospital's perspective, these exchange relationships can draw the institution into the managed care network's sphere of influence, a dependency-creating situation that may be warranted, but which must also be managed.

The resource dependence perspective provides an insightful means for analyzing and understanding how hospitals respond to dramatic environmental change. When a hospital engages in exchanges with HMOs or PPOs to procure critical resources, these exchanges typically bind the institution to conditions that increase its dependence on the network. The ability of the hospital's or the network's management to act autonomously, therefore, becomes constrained to the degree one is dependent on the other for survival.

The resource dependence perspective specifically addresses the nature of exchange relationships, directing attention to how an organization interacts with others and its environment to secure critical and often uncertain resources through exchange (Pfeffer & Salancik, 1978). The focus of analysis is on the organization (Pfeffer, 1982) which actively competes with others over access to limited resources in the environment (Aldrich, 1979). As open systems, organizations try to adapt to an

influential environment, and, as goal-driven systems (Aldrich, 1979), organizations also try to influence their environment making them agents of change as well (Zuckerman & D'Aunno, 1990). Because no organization is entirely self-sufficient, its survival depends on securing and maintaining those resources critical to its functioning (Pfeffer & Salancik, 1978). By entering into exchange relationships with other organizations to secure or to stabilize the flow of those critical resources, organizations become mutually interdependent (Thompson, 1967). The dependencies created by these exchange relationships impose on the organization's ability to act autonomously (Emerson, 1962). These interdependencies are adjustable, however (Pfeffer & Salancik, 1978), and must be actively managed, especially if they are contingent on important resources, or the cost of switching is great (Kotter, 1980).

Related Resource Dependence Applications

Cook, Shortell, Conrad and Morrisey (1983) offer a framework for analyzing hospital response to regulation by integrating possible intraorganizational and interorganizational responses with Parsons' (cited in Cook et al., 1983) classification of three levels within an organization for responding to the environment. In the Cook et al. model, organizations can respond to environmental stimuli at the institutional, managerial or technical levels. Because of its focus only on hospital response to regulation, Smith and Mick (1985) consider the Cook et al. model too deterministic

and limited, suggesting it should be more probabilistic and could be re-formulated to complement other management theories and to extend its generalizability and applicability. Subsequent application of this framework has shown a progression toward other measures of uncertainty beyond regulation, and diffusion of dependent measures.

For example, Alexander and Morrisey (1989) used a resource dependence framework to evaluate the hospital institutional-level response strategy of contract management in response to the external forces of regulation and market conditions. The authors examined the interplay between certain enabling factors supporting hospital autonomy while competing for environmental resources. Provan (1988) also focused on institutional-level responses by empirically examining the interorganizational influence of multihospital system affiliation on affiliated hospital board decision making.

Looking closer at the organization through the lens of resource dependence, Gay, Kronenfeld, Baker and Amidon (1989) found hospitals could no longer protect, or buffer, their technical core under severe pressure from fiscally constraining regulation, and instead changed their practices and marginal products. This work underscores the importance of an organization's core technology, or the arrangements for performing the central tasks of the organization (Scott, 1987). An organization will usually attempt to artificially seal off, or "buffer," its technical core under adverse environmental influences. Although many buffering strategies may be

pursued, they are all similar in presenting an intraorganizational response for reducing uncertainty for the technical core (Scott, 1987).

When environmental forces exceed the ability to buffer its technical core, an organization might instead try modifying its boundaries by "bridging" with others through boundary-spanning and boundary-shifting strategies (Scott, 1987). For example, Carter (1990) adapted the Cook, et al., (1983) model to examine how physician practices, as small firms, responded to regulatory and competitive uncertainty. Contrary to expectations, Carter found that these firms might even consider technical level boundary spanning responses before attempting buffering strategies or boundary spanning at the institutional level. Zuckerman and D'Aunno (1990) examined why hospitals might join alliances as a boundary-spanning strategy for pooling resources and reducing environmental uncertainty. The authors also evaluated why hospitals specifically join more constraining hospital federations when they are highly dependent on organizations threatening to withdraw resources (D'Aunno & Zuckerman, 1987). Pfeffer and Salancik (1978) state that the type of exchange relationship which ultimately develops between organizations can vary between being asymmetrical and symmetrical. Relationships are asymmetric when the relative scarcity and significance of the resources exchanged is greater for one party. They are symmetric when both share about equally in the need for the resources.

Anderson, et al. (1985) adapted the resource dependence perspective to their study of HMO development noting that hospital-HMO relationships are sometimes

]highly asymmetric, as in the case of hospitals sponsoring HMOs, or HMOS sponsoring hospitals (the latter case being far less frequent, exemplified mainly by the Kaiser Foundation model). The authors suggest, however, these relationships are most frequently symmetric, built on the mutual needs of both parties and are contractually negotiated. Typically, the authors point out, hospitals may provide a range of service commitments specified in formal contracts of exchange, from full service contracts wherein they provide all available services to the HMO, to limited service contracts providing special services. Informal arrangements, which are not contractual, may also develop, as in the case of physician referrals. Again, the authors argue that formal contracts are more common, and that financial arrangements between the two entities are always formalized by written contract, which may be initiated by either party. In hospital-HMO affiliations, the medium of exchange might be patient access, convenience (e.g., geographical proximity to work or residence), reputation or diverse service lines from the hospital; and patient volume, market access and revenue generation from the HMO. The authors also repeatedly point out the simultaneity of effect of one entity on the other: hospitals influence HMO entry and development, just as HMOs influence hospital operations.

It is interesting to note that Cook, et al. (1983) proposed that hospital affiliation with HMOs may also be an appropriate interorganizational response to environmental uncertainty for hospitals at the institutional level. While not specifically using the typology by Cook and colleagues, Kralewski, et al. (1992),

applied resource dependence to identify the factors motivating hospitals to provide discounts to HMOs, as well as those determinants related to the magnitude of the discounts. The authors posited a hospital's decision to contract with an HMO was based on its: (1) criticality of need for the HMO's patient resources; (2) tolerance for interdependence with external organizations such as HMOs; and (3) expectation of direct benefits resulting from the exchange. Applying resource dependence arguments, the authors hypothesized that the greater the importance a particular resource is to a hospital's survival, and more scarce its availability in the environment, the greater the likelihood the hospital would attempt to secure its access by sacrificing institutional autonomy and control through a resource exchange relationship with an HMO.

HMOs and PPOs As "Distribution Channel Agents"

Under the traditional fee-for-service system, patients freely selected their physician. In concert with the patient, the physician directed the demand for hospital and other services. Unfettered by the development of utilization management techniques, provider gatekeeping, or extensive cost sharing, patients consumed, and providers delivered, health care services essentially without regard to cost (Fuchs, 1974; Goldsmith, 1988). Reinforced by a fragmented financing system paying providers on the basis of incurred costs (Showstack, Blumberg, Schwartz &

Schroeder, 1979), hospitals and physicians formed symbiotic relationships. Although Harris, Hicks and Kelly (1992) note these relationships ensured the independence and autonomy for physicians relative to hospitals, physician sovereignty and professional self control also helped hospitals to maintain their autonomy relative to external sources. The authors also contend the emergence of managed care networks like HMOs and PPOs, with their emphasis on hospital cost efficiency and ability to selectively contract with providers, has disrupted the previously stable relationship between hospitals and physicians. These networks have, in essence, created **distribution channels** for health care where none had previously existed.

Many industries rely extensively on intermediate distribution agents between end suppliers of services and the ultimate users of those services (Kotler, 1991). In today's business economy, the distribution systems for products and services involve critical intermediaries between the producers and the final users. Kotler classifies these intermediaries as "merchant middlemen" when they own or take title to the goods, "agent middlemen" when they do not take title but negotiate on behalf of the producer, and "facilitators" when they coordinate the interplay between seller and buyer, but take neither title or perform negotiations. Kotler notes these intermediaries are vital external resources for both the buyers and sellers. The relationships usually take years to build, require significant corporate commitment, and are not easily changed without substantial effort. Because of their critical positions in the distribution channels and the inertial tendencies by the participants over time to avoid

change, these arrangements often form into enduring relationships.

Selective contracting, the hallmark of HMOs and PPOs (Cooper & Green, 1991), in combination with diverse choice in provider sources and venues, diminishes the relative importance and centrality of hospitals in the emerging distribution system for care (Goldsmith, 1988). Hospitals must increasingly search for stable avenues to market their services and provide predictable patient flows. These "avenues" present the classic need for managed distribution systems as Kotler (1991) described them. Although the distribution of hospital services may be performed by many intermediaries, HMOs and PPOs provide a more specific distribution process by ensuring patients are sufficiently motivated to choose the contracted hospital's services (Clement, 1990). Similar to other distributors, HMOs and PPOs not only provide an outlet for provider services such as hospital care, they also serve to enhance the access to those services for buyers (Brown & McCool, 1986). Hospital contracts with these organizations may also moderate problems with consumer uncertainty and limited information which have been considered critical in the failure of the health care marketplace to reach efficient exchanges (Arrow, 1963; Hurley & Fennell, 1990).

The central position HMOs and PPOs hold in the emerging health care distribution system reflect the characteristics of commitment, enduring relationships and channeling of services and products found in other industry distribution agents. But depending on the organizational structure, some do take "title" to services (e.g., HMOs which assume risk for the health of subscribers, irrespective of utilization),

while others act more as agent middlemen in negotiating on behalf of their corporate clientele (e.g., PPOs). Certainly each entity can add unique value to the services it arranges or provides and perhaps can create competitive pressures on hospitals by offering some services which might be substituted for acute inpatient care. HMOs and PPOs present hospitals with a traumatic choice as well regarding how their services might be distributed to purchasers. On one hand, HMOs and PPOs facilitate the distribution of the hospital's services to large purchasers, access to purchaser beneficiaries, and dollars back to the hospital. Networks can even offer this access on an exclusive basis, similar to a franchise. To the extent hospitals become critically dependent on this distribution system, they face the threat of becoming subsumed to the network in the role of "cost center" (Higgins & Meyers, 1987). On the other hand, the networks can instead distribute the services of other providers to purchasers, and so channel the funds and patients elsewhere, away from the hospital.

Considering HMOs and PPOs collectively by the simplifying term "distribution channel agents" (DCAs) captures the essence of how these networks, from the hospital's perspective, serve a potentially unique role in the evolving system of health care services, one which places them in control over the critical resources hospitals need to survive. Viewing HMOs and PPOs as DCAs is also useful for emphasizing their functional commonality. Functionally, HMOs and PPOs can be collectively differentiated from other forms of managed care such as third party administrators that are less focused on permanent relationships designed with the

strategic intent of channeling patients. The noted differences between HMOs and PPOs provide variation in accomplishing, ultimately, the singular function of controlling, or channeling, the manner in which their members seek care, and their preferred providers deliver it.

Hypotheses

As stated earlier, the decision to affiliate with HMOs and PPOs, or DCAs collectively, can involve two related decisions. The first decision is whether to affiliate with any DCA at all. If DCA affiliation is chosen, the hospital must then decide with which DCA form to affiliate, either an HMO or a PPO or both. Responding to the second and third research questions in the present study, testable hypotheses can be derived from resource dependence arguments to evaluate the relative influence of various hospital and market attributes on an institution's propensity to engage in resource exchange relationships with HMOs and PPOs.

Managing affiliations requires significant investment of the hospital's internal resources in terms of staff, space and management systems. Hospitals willing to affiliate with a DCA, but lacking or unwilling to use these resources, face the possibility of being held hostage to demands for utilization information, deeper discounts, and a number of other invasive pressures. The greater these invasive pressures are, the more likely the relationship between the DCA and hospital will be

asymmetric, and the more likely the hospital will be dependent on the DCA for management of its resources affected by the affiliation. Hospitals concerned with avoiding or minimizing an asymmetric relationship and the attendant loss of power must therefore be capable of infusing the necessary resources to manage the exchange. In this manner, it would appear that because they have the resource capacity to manage multiple interdependencies,:

> **Hypothesis #1** The larger the hospital, the more likely it will affiliate with a DCA.

Because they have the resources to manage multiple interdependencies, when DCA affiliation in chosen:

> **Hypothesis #2:** Larger hospitals will more likely affiliate with **both** HMOs and PPOs to maintain patient volume.

The decision to establish formal relationships with other organizations demands acceptance of interdependent relationships. Hospitals that have successfully pursued strategies of affiliation with other organizations have accepted interdependence. This would suggest that having already accepted interorganizational dependencies:

> **Hypothesis #3:** Hospitals in multihospital systems or involved in teaching programs will more likely affiliate with DCAs than others.

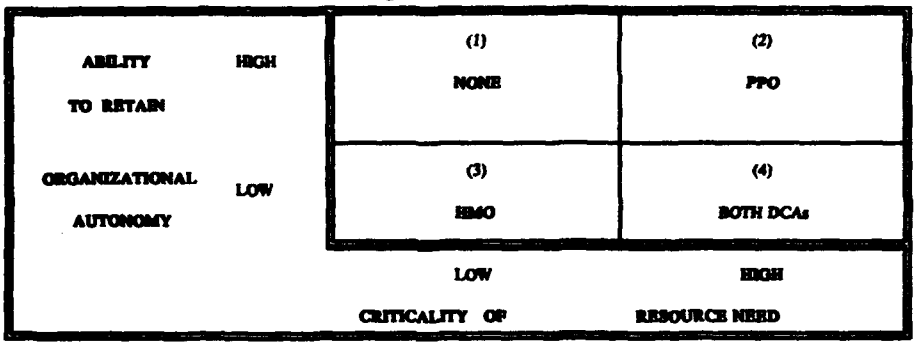
Hospitals must carefully balance two considerations for survival: the need to assure stability of critical resources and the need to maintain autonomy or sovereignty over their activities. In the absence of the former, the organization cannot achieve its goals; yet without sovereignty, it ceases to exist as an independent goal-seeking institution, and instead serves as an appendage to other institutions. The competing pressures on organizations for autonomy and resource stability have been argued elsewhere as determinants for interorganizational relationships ranging from arms-length contracting to joint ownership arrangements (Conrad & Dowling, 1990; Pointer, Begun & Luke, 1988).

From the hospital's viewpoint, these two dimensions can be united in a classification scheme for evaluating and hypothesizing about interorganizational relationships with DCAs. As shown in Figure 3, the criticality of resources required by a hospital may range from relatively low, to quite high, and its ability to retain its autonomy may also range from low to high. The interaction of these two dimensions offers an institutional-level response "map" by which the hospital's motivation for boundary spanning activities might be discerned.

By considering the interaction of the dimensions of autonomy and resource need, Figure 3 presents a useful model for predicting four hospital responses regarding the need to affiliate with a DCA. First, a hospital able to retain its autonomy and without significant concern over the stability of resources would most likely not bother to affiliate with any DCA, and rely strictly on existing fee-for-service arrangements

(first quadrant).

Figure 3. Hospital Strategies for Selecting DCAs:
A Resource-Dependent Prediction Matrix



Once the hospital decides its resource needs are too great to avoid entering into an exchange relationship with a DCA, it must then decide which one(s) to approach, balancing the desire to retain autonomy with the need for those resources. Based on the earlier review of the differences between HMOs and PPOs, and the possible interests served by the hospital affiliating with either one, PPOs appear to be the second best alternative to fee-for-service, and able to provide the necessary resources with minimal loss of autonomy to the hospital. Since a hospital would presumably not even consider affiliation with a DCA unless the stability of its resources were in question, this model would predict that hospitals with a strong desire to retain their autonomy but faced with an urgent need for resources will attempt to affiliate with PPOs (second quadrant).

A hospital with a relatively lower exigency in stabilizing resources and more willingness to lose some of its autonomy to obtain those critical resources might be expected to affiliate with an HMO (third quadrant). This situation might be best exemplified by hospitals attempting to strategically position their operations for future market penetration by managed care, or by those preparing to extend their operations by developing their own DCA. Finally, hospitals facing greater need to obtain those resources and either little desire or ability to retain their autonomy may elect to affiliate with both HMOs and PPOs (fourth quadrant). The consequences of this model can therefore be stated as:

> **Hypothesis #4**: Hospitals with relatively low need for resources and significant autonomy will perceive less uncertainty over their resource flows and will buffer their technical core by avoiding affiliations with DCAs.
>
> **Hypothesis #5**: Hospitals with substantial need for resources but also significant autonomy will more likely seek affiliation with PPOs than HMOs to secure their critical resources.
>
> **Hypothesis #6**: Hospitals with low critical need for resources and limited ability to retain their autonomy will more likely affiliate with HMOs than PPOs to secure their critical resources.
>
> **Hypothesis #7**: Hospitals with high resource need and low ability to retain autonomy will more likely attempt to secure those resources by multiple boundary spanning strategies, represented by affiliations with both PPOs and HMOs.

The studies by Kralewski and colleagues (Kralewski, et al., 1983, 1991, 1992) suggest an important market factor influencing a hospital's participation in an

exchange with an HMO was the number of local hospitals available to provide similar services desired by the HMO. Extrapolating this argument further, the availability of similar hospitals capable of meeting the needs of a DCA within a particular market implies the potential for competition over limited resources such as patients or purchaser dollars. This would suggest that:

> **Hypothesis #8**: Hospitals in a competitive environment will be more willing to sacrifice some of their autonomy through affiliation with a DCA than those in less competitive markets.

Selective contracting by DCAs for hospital services can have a number of consequences for the hospital. Exclusion from the network requires maintaining existing, and perhaps tenuous patient sources, or searching for other countervailing arrangements to provide surety of patients. If the hospital contracts with the DCA, then it must face the financial consequences of that decision. These arrangements may sustain or build the hospital's workload, and thus maintain or improve its overall financial position; or they may undermine the financial base of the institution to the extent volume does not increase sufficiently to offset corresponding constraints or reductions in unit price. In the short run, some hospitals may join such arrangements purely as a matter of survival, especially where their prospect for survival is already in question (Irish, 1992). Also in the short run, hospitals with substantial capacity or reserves to outlast declining marginal payments may affiliate with these organizations

in pursuing a strategy designed to "outlast" others similarly linking to them. In the long run, however, hospitals must be prepared to withstand continuous pressures to improve their efficiency relative to stated plan standards (Chilingerian, 1992). In the latter case, these hospitals must therefore be able to document their efficiency to the satisfaction of the plan. These arguments suggest the proposition that hospital performance and DCA affiliation are positively related, but not necessarily upon initial affiliation. This proposition implies:

> **Hypothesis #9:** At the aggregate level, hospitals affiliating with DCAs, in general, will initially not be any more efficient than those that do not affiliate, because both the DCA and the contracting hospital will be concerned more with developing the relationship and preserving their autonomy.

From the perspective of the plan, an HMO or a PPO confers preferred status for selected participating providers and then collaborates with them to improve its insurance, marketing, capital formation and information processing operations (Griffith, 1983). To the extent a hospital can determine which plans have followed or might follow this collaborative interorganizational strategy, the hospital could use this opportunity to pursue the collateral strategy of improving its competitive position through increased operational efficiency. Operational efficiency could be in terms of internal operations, as well as those boundary spanning activities which would increase the efficiency of the interorganizational structure, for example, in communications,

utilization review and economic credentialling (Frieden, 1992b). Hospitals facing competitive pressures (over price) have a number of options, with becoming more efficient the option of choice for payers (Chilingerian, 1992; Ginsburg & Hammons, 1988). Efficient hospitals may want to differentiate their services from other hospitals by affiliating with DCAs having a reputation for aggressive utilization management and network controls, such as HMOs. This strategy could provide synergies for the participants, while helping to stabilize the distribution of services, patients and monies. This suggests that:

> **Hypothesis #10:** Within the group of hospitals initially affiliating with a DCA, those that contract with an HMO will be more efficient than those contracting with a PPO.

Summary

Hospitals establish exchange relationships through contracts with HMOs and PPOs. These relationships are intended for improving the respective performance of participating organizations. Hospital performance can be examined from a resource dependence perspective for understanding how organizations acquire critical resources while managing undue loss of their sovereignty in pursuing other goals. Responding to the second and third research questions of this study, ten hypotheses are derived to

evaluate several hospital and market factors that are expected to influence hospital affiliations with HMOs and PPOs. Hospital factors such as size and prior acceptance of interdependencies with other organizations are hypothesized as key predictors of hospital affiliation strategies (Hypotheses 1 through 3). The degree of competition is also hypothesized as influential in these exchange relationships (Hypothesis 8). Additional hypotheses are offered reflecting the key argument implied in advocacy of managed care competition, that provider efficiency should constitute a significant factor in the type of DCA contracted (Hypotheses 9 and 10). HMOs and PPOs can be collectively considered as distribution channel agents (DCAs) from the hospital's perspective because they control access to critical patient and funding resources. A model for deriving hypotheses and evaluating affiliations is presented considering two dimensions: the hospital's ability in retaining autonomy and the criticality of resources needed (Hypotheses 4 through 7).

The next chapter presents the methodology for evaluating the extent to which the scope of affiliations with DCAs has changed over the past decade. It provides the means for operationalizing the resource dependence-based hypotheses, techniques and statistical tests for evaluating the influence of organizational and market factors on hospital affiliation strategies.

CHAPTER 4
METHODOLOGY

Focusing on the hospital as the unit of analysis, this chapter presents the research methodology for examining the scope and determinants of hospital affiliations with distribution channel agents (DCAs). This chapter delineates the specific research design, sampling methodology, sources of data and variable measurement used in the analysis. The analytic techniques for empirically testing the resource dependence-based hypotheses articulated in Chapter 3 are also presented.

Research Design

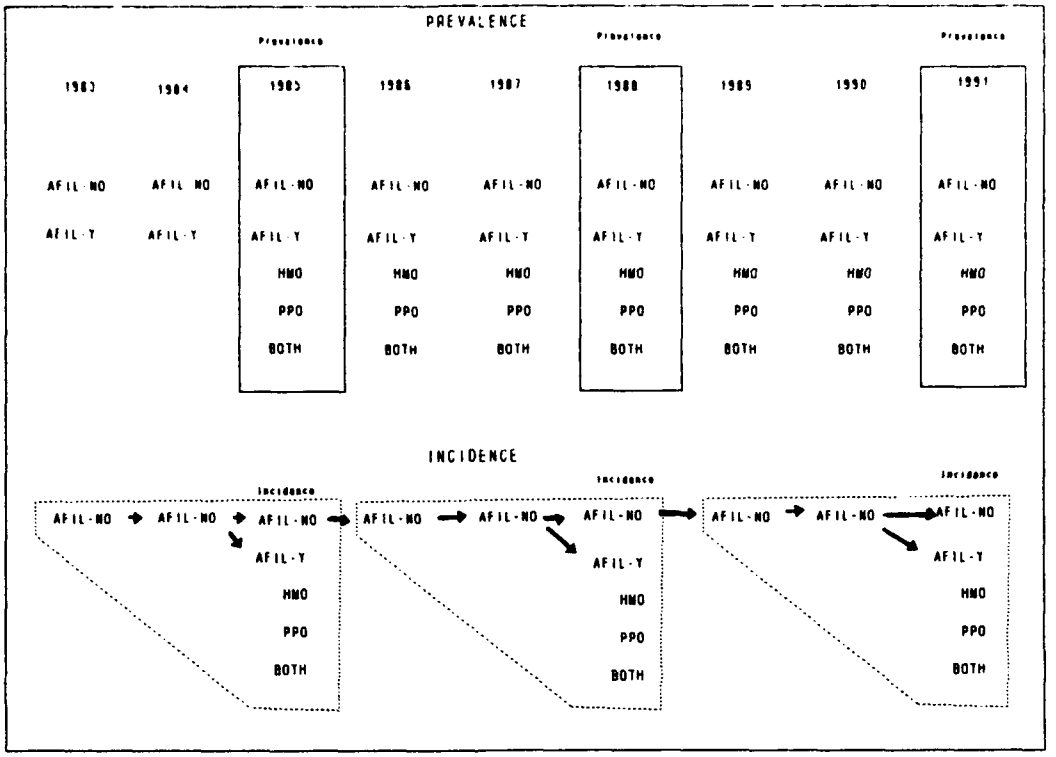
A multiple cross-sectional design using intermittent time-series data is employed for examining the relative influence of hospital and local market factors on hospital affiliations with DCAs. This exploratory analysis seeks to identify and understand the extent of variation in hospital affiliations with DCAs. Variation in affiliation strategies is expected across hospitals within a given year, as well as over time across multiple years. Using secondary longitudinal data, this observational study is both descriptive, in exploring the occurrence, trends and determinants of the event of affiliation, and analytical, in testing *a priori* hypotheses (Kleinbaum, Kupper

& Morgenstern, 1982). The need for longitudinal data rests on a central conclusion reached from the literature on hospital-DCA affiliations: hospital-DCA affiliations are still maturing and variation should therefore be identifiable over the past decade.

The analysis of this expected variation is accomplished in two stages. Addressing the first research question asking how the scope of affiliations with DCAs has changed over the past decade, the first stage focuses on the point prevalence, or existing and cumulative affiliations. In this stage, cross sectional profiles of hospital characteristics are developed across multiple years as depicted in the top half of Figure 4. These profiles are examined to understand the extent of variation among hospitals and to discern what, if any, trends have emerged over time. The figure shows, for example, how annual profiles are created for each of the four affiliation categories (affiliation with any DCA, labeled as "AFIL-yes" or "AFIL- no"; and, among affiliated hospitals, those that are affiliated with HMOs, with PPOs or with "BOTH").

Figure 4 also highlights how the extent to which hospital and market variables have changed over time is addressed by examining the data over three points in time: 1985, 1988 and 1991. The year 1985 is selected as the first time frame for profiling hospital market and organizational conditions in the early to mid 1980s to capture the health care industry's most recent shift in the prevailing locus of control in focusing attention on controlling costs by transferring greater responsibility to providers of care (Havighurst, 1986). The rate of hospital closures has also profoundly shaken the hospital industry over the past decade, especially since 1985 (AHA "Hospital

Figure 4. Research Design Strategy



Statistics", 1992). In this respect, 1985 is appropriate because it coincides with the end of the three-year phase-in period for Medicare's prospective payment for operating costs, as well as the year in which Medicare began aggressively to encourage beneficiaries to enroll in alternative delivery systems (Harrington, Newcomer & Moore; Wilensky & Rossiter, 1991). Beginning the analysis with this year would minimize any confounding affects on cost and related measurements associated with hospitals adjusting to the new reimbursement methodology. The year 1985 also seems to present a point of demarcation in the literature, where discussion

of managed care networks noticeably began including PPOs, in addition to the more frequently discussed HMO plans. Industry trade journals tend to address PPO development in terms of "before 1985" and post-1985 (Marion Merrell Dow, "PPO Edition, 1992). The rapidly increasing number of PPO plans had also reached parity in the nation with the number of HMO plans in 1985, at 393 each (Kongstvedt, 1993, p. 260). Thus 1985 appears to be a juncture in hospital development that coincides with real choice as to affiliate with one of two thriving managed care network forms.

Basing the second time frame on 1988 was selected because the prevalence in the number of HMO and PPO plans appears to have reached a zenith (Kongstvedt, 1993) even as the number of plan beneficiaries has continued to increase. This change in the growth of the two predominant managed care networks, combined with the number of hospital closures, suggests industry consolidation had begun to occur. Analysis of hospitals in 1988 therefore offers a mid-point between the end of the industry expansion phase of the early 1980s and the beginning of an industry consolidation phase. This point provides a means for reflecting any changes in the hospital market place or in the nature of the hospital industry somehow influencing strategic orientation toward DCAs. Using 1991 for the final time frame was appropriate because it offered the most recently available data and provided the latest end point in longitudinal analysis (Dwyer & Feinleib, 1992).

Because the second and third research questions address the influence of organizational and market factors on the propensity for hospitals to engage in DCA

affiliations for the first time, the second stage of the study concentrates on the incidence (i.e., new cases) of affiliation. The bottom half of Figure 4 shows the general research design used for evaluating the first, or initial occurrence of affiliation. For example, analysis of the factors influencing hospitals to affiliate for the first time in 1985 require removing from consideration those hospitals affiliating with a DCA in prior years, indicated by "AFIL-No" in both 1983 and 1984. Analysis of those hospitals affiliating for the first time in 1988 must be similarly restricted to those hospitals that have consistently avoided affiliations prior to that year (here, from 1983 to 1987). Organizational and market factors associated with newly affiliated hospitals are then compared to the same factors associated with non-affiliated hospitals.

Model Specification

In considering possible affiliation, hospitals initially face a dichotomous choice, whether to affiliate or not (AFIL). Affiliation is considered a binary choice at this stage. Once the decision is reached to affiliate, hospital management must then choose the appropriate DCA. This study considers three subsequent binary choice sets: whether to affiliate with an HMO (HMO), a PPO (PPO), or both (BOTH). Each of these dependent variables are coded as either yes or no, and are regressed on vectors of hospital and market covariates. In the absence of any theoretical or

empirical work suggesting otherwise, the same model is used for analyzing each strategy. In these models, the propensity for a hospital to affiliate with a DCA in a given year is a function of key hospital attributes (HOSP) and market characteristics (MKT). The specification of the models and the composition of the covariate vector are shown below:

$$\begin{aligned}
\mathbf{AFIL}_{i,j} &= f(\mathbf{HOSP}_{i,j \text{ or } j-1}, \mathbf{MKT}_{i,j \text{ or } j-1},), \\
\mathbf{HMO}_{i,j} &= f(\mathbf{HOSP}_{i,j \text{ or } j-1}, \mathbf{MKT}_{i,j \text{ or } j-1},), \\
\mathbf{PPO}_{i,j} &= f(\mathbf{HOSP}_{i,j \text{ or } j-1}, \mathbf{MKT}_{i,j \text{ or } j-1},), \\
\mathbf{BOTH}_{ij} &= f(\mathbf{HOSP}_{i,j \text{ or } j-1}, \mathbf{MKT}_{i,j \text{ or } j-1},)
\end{aligned}$$

where:
i denotes the *i*th hospital; *j* denotes the *j*th year (j=1984-1991), and *j-1* denotes the year preceding year *j*; and,

AFIL = Affiliation with a DCA in a focal year (Yes = 1, No = 0).
HMO = Affiliation with an HMO (Yes = 1, No = 0),
PPO = Affiliation with a PPO (Yes = 1, No = 0),
BOTH = Affiliation with both an HMO and a PPO (Yes = 1, No = 0),

HOSP = Hospital Characteristics, including:
Ownership, system affiliation, size, service mix, medical residency programs, patient severity, geographic region and efficiency.

MKT = Market structure characteristics at the MSA level, including:
Number of competing hospitals, market share, market concentration, and relative affiliation status.

In this model, analysis of the **prevalence** of affiliations measures independent

variables in the same year as affiliation status, whereas analysis of the incidence of new affiliations lags the measurement of the dependent variable one year later than measurement of the independent variables (Wassertheil-Smoller, 1990). The factors associated with a hospital's decision to affiliate for the first time (incidence) are not expected to occur simultaneously with the decision. A reasonable time lag should be allowed between the period when a hospital determines affiliation is appropriate, and the exchange agreement is completed. Such a time lag should adequately accommodate the extensive process of considering strategic options, and then evaluating and negotiating contracts with DCAs. While there appears no consensus as to what constitutes an appropriate time lag, a minimum of one year seems appropriate, and is employed in the second stage of analysis focusing on the incidence of new affiliations.

General Hospital Attributes

Organizational variables in this study are those institutional characteristics that essentially differentiate hospital capabilities and activities. An institution's decision to affiliate with DCAs reflects the culmination of long term strategy formulation which may lead to highly enduring exchange relationships. This study addresses the scope of hospital affiliations (first research question) using several commonly accepted organizational variables. These organizational variables are supplemented by other

chapter and respond to the second and third research questions. Table 1 specifies the four dependent variables of affiliation and the independent variables delineating hospital attributes. The hospital variables used to test the resource dependence hypotheses are described first, including several variables for measuring efficiency (Hypotheses 9 and 10). Supplementary variables used to control for differences in hospital ownership, patient severity and regional variation are then discussed, followed by those used to operationalize the hospital's market (Hypothesis 8). hospital measures of efficiency and market variables are also combined to assess several hypotheses (4-7).

The first two hypotheses posit that hospital size is positively related to affiliation with DCAs. Although hospital size can be measured in many ways (e.g., existing capacity, volume of workload or dollar transactions), this study operationalizes hospital size using two variables, its actual workload volume and the diversity in mix of services beyond its core technology of general medical-surgical inpatient care.

Table 1. Study Dependent and Independent Hospital Variables and Measurement

Variable Name	Measure
DEPENDENT VARIABLES: AFIL	Presence of any hospital contract with either an HMO or a PPO, or not at all (Yes=1; No=0)
HMO	Given AFIL=Yes, whether contract is with an HMO or not (Yes=1; No=0)
PPO	Given AFIL=Yes, whether contract is with a PPO or not (Yes=1; No=0)
BOTH	Given AFIL=Yes, whether contract is with both an HMO and a PPO or not (Yes=1; No=0)
Independent Variables:	All variables measured on a fiscal year basis
Hospital Factors: OWNERSHIP: PUBLIC, PVTNFP, PVTIO	Ownership or control (Yes=1; No=0) Public (non-federal government); Private, Not-For-Profit (used as reference category; and Private, Investor-Owned
SYSTEM	Membership in multi-hospital system (Yes=1; No=0)
DAYS	Size/Scope: adjusted patient days = Total inpatient days and equivalent patient days attributed to outpatient services, computed as: Patient Days + [Patient Days * (Outpatient Revenue/Inpatient Revenue)]
SERVMIX	Scope: Ratio of the number of institutional services to 10 selected services
RESIDENT	Medical Education Involvement: Number of intern and resident FTEs, using (Full Time + .5* Part Time)
SEVERITY	Proxy for hospital case-mix/patient acuity: Ratio of total hospital patient days in special/intensive care units to total inpatient days
REGION: NRTHEAST, NRTHCENT, WEST, SOUTH	Region (Yes=1; No=0) Northeast, North Central, West, South (used as reference category)

Table 1. (Continued) Study Independent Hospital Variables and Measurement

Variable Name	Measure
Efficiency: FTEBED	Productivity-- computed as the ratio of derived FTEs to adjusted occupied beds; higher the value, lower the productivity, where: FTE= Sum of full-time + .5 * Part-time staff Adjusted occupied beds= ratio of adjusted patient days to 365 days
ROCUP	Process Efficiency: The relative occupancy rate computed as the ratio of the hospital's occupancy rate to the average of community hospital occupancy rates in the MSA
RALOS	Process Efficiency: the relative average length of stay computed as the ratio of the hospital's ALOS to the average of community hospitals' ALOS in the MSA
COSTEF	Cost In-Efficiency: Computed as the ratio of total hospital expenses to adjusted patient days
TECHEF	Technical Efficiency: Computed by Data Envelopment Analysis: Outputs= Adjusted Admissions & Total Inpatient/outpatient Surgeries Inputs= BEDS, FTEs, SERVMIX and total non-payroll expenses

Note: All variables are measured from data in the AHA computerized data files, 1984-1991.

The continuous variable annual adjusted inpatient days (DAYS) serves as a proxy measure for the scale of hospital operations. The variable DAYS accounts for the actual production of inpatient and outpatient services in a single, parsimonious measure, defined as the sum of inpatient days and equivalent patient days attributed to outpatient services (derived by the product of inpatient days and the ratio of outpatient revenue to inpatient revenue). The scale of a hospital's operations may

provide certain advantages for meeting the diverse service needs of DCAs, as well as accommodating their potentially large and concentrated volume. While the scale of operations could be measured by the number of staffed and licensed beds (Nutt & Milter, 1992), bed numbers do not provide evidence of patient volume utilizing those services, nor reflect the extent to which the hospital's scale is oriented toward outpatient services.

The scope or mix of services (**SERVMIX**) a hospital offers is an important marketing factor when vying for contracts with DCAs desiring a full range of services for their membership while requiring their access be restricted to a limited set of network providers (Conrad & Dowling, 1990; Hester, et al., 1987; Trauner & Hunt, 1986). This continuous variable is measured by the proportion of 10 selected specialized services offered by the hospital (thus ranging from 0 to 1.0), including treatment for alcoholism/chemical dependency, emergency services, patient education, outpatient surgery and occupational therapy. As shown in Appendix A, these services are selected because they reflect a broad array of "products" beyond the hospital's inpatient core technology for which DCAs and their principal buyers might require. Zelman and McLaughlin (1990) agree on the importance of a hospital's service mix in appealing to DCAs, but imply this feature may be differentially successful. The authors contend hospitals should develop broad service capability to appeal to HMOs or offer a narrower range to appeal to PPOs. Since the **SERVMIX** variable is used in both the AFIL and DCA models, it should discern the validity of this contention.

Hospital that are members of multi-hospital systems or involved with medical education are hypothesized as more likely to affiliate with DCAs (Hypothesis 3). Membership in a multihospital system (**SYSTEM**, dichotomously coded as 1 or 0) is a key hospital factor associated with the degree to which an institution has conceded some autonomy to gain access to critical resources (Provan, 1984). System membership has been found influential in the aggressiveness of hospital strategies (Shortell, et al., 1990), predictive of hospitals using contract management (Alexander & Morrisey, 1989) and a strong determinant in California hospital contracting rates with insurers (Mobley, 1992).

Hospital involvement with medical education is reflected in the continuous variable summing the number of full and part-time interns and residents in the hospital (**RESIDENT**). Medical education programs provide hospitals considering affiliation a means for differentiating their services in terms of research and development, public service and state of the art technology. A number of studies have used instead the dichotomously measured membership in the Council of Teaching Hospitals, COTH (e.g., the Kralewski et al. 1992 study of hospital discounts to HMOs). While COTH membership indicates the hospital has at least four AMA-approved residency programs (Goldfarb & Coffey, 1987), unlike a measurement based on the number of interns and residents, it fails to reflect the magnitude of hospital involvement. Others, such as Alexander and Morrisey (1989) have used the number of interns and residents per bed to operationalize medical education programs. By relating the number of residents to

beds, however, researchers increase the likelihood the variable will be strongly correlated with other measures of hospital size. For example, while Alexander and Morrisey (1989) found their measure of medical education to be highly predictive of hospitals using management contracts, they found only modest support for organizational size, measured in beds. The limited support for bed size may have been substantially due intercorrelation between the two variables, thus masking the real effect of size.

In addition to the organizational variables specified above, three additional variables are examined to address the changing scope of affiliations over time (research question 1), and to assess for differences in hospital affiliation due to attributes not hypothesized: ownership, patient severity and regions. Hospital ownership and control is measured by three dichotomous variables distinguishing institutions that are nonfederal government (**PUBLIC**); private, investor-owned (**PVTIO**); and private, not-for-profit (**PVTNFP**). Each variable is coded as 1 when the condition is present, and 0 otherwise. PVTNFP hospitals are used as the reference category in multivariate analysis because they represent the vast majority of hospitals in the U.S.

Ownership is useful for serving as a proxy measure for distinguishing hospital mission and market orientation (Shortell, Morrison & Friedman, 1990). While ownership may be related to the propensity to affiliate with HMOs (Kralewski, et al., 1992), the factor may influence hospitals differently with respect to PPOs. As

Shortell, et al. contend, although the traditional distinctions between investor-owned (IO) and not-for-profit (NFP) hospitals may be blurring, as all hospitals face increasing incentives to contain costs and compete more on the price of services, profit orientation still provides an important proxy measure for a hospital's mission influencing the way it responds to environmental stimuli.

The ratio of patient days involving use of intensive and special care beds to total bed days (**SEVERITY**) provides a proxy measure for general patient acuity in a hospital, and therefore, its casemix (Shortell et al., 1990). Shortell et al. compared this measure to the unpublished 1984 HCFA case mix index (CMI) in their analysis of the determinants of hospital mortality rates in 1983 and 1984. The authors found these two measures moderately associated ($r = 0.45$ with $p \leq 0.0001$ and $n = 981$ hospitals) and, while the severity measure was significantly associated with hospital mortality rates, the case mix index was not.

The **SEVERITY** measure was used in this study for several reasons. First, the data were more readily available for the period of time under study than HCFA's case mix, and provide a simple measure that is consistent over time (HCFA began publishing the data in 1985, with several changes to the computation methodology over the years). Second, using **SEVERITY** permitted retaining a larger sample which was critical in analyzing the incidence of new affiliations, especially in later years. Using the CMI would have required restricting the sample to only Medicare hospitals from which the CMI was derived. The CMI also technically pertains only to

Medicare patients, and not all patients. Finally, perhaps consistent with the historically limited association between Medicare and managed care, there is no theoretical or empirical evidence supporting use of the CMI as a significant predictor of DCA affiliations.

The **SEVERITY** measure was initially incorporated in two ways, as an individual independent variable for evaluation of its influence on affiliations, and also to adjust the efficiency measures to compensate for differences in average patient acuity, and, by proxy, differences in patient complexity and resource use. Although this variable provides a readily available and consistent measure over time, and compensates for the unavailability of other general measures in the early 1980s as PPS phased in, it may tend to underestimate the general severity of patients in hospitals with more beds. That is, as hospital bed size increases, intensive and special care beds may not increase proportional to total beds, and the ratio of special to total beds will consequently decrease.

Significant variation in hospital activity has been found among geographic regions that must be controlled in multivariate analysis. Regional variation exists with respect to the extent to which hospitals become members of multi-hospital systems (Fennel & Alexander, 1987), the growth rate of investor-owned hospitals (McCue & Furst, 1986), and reflective of differential patterns of hospital services use (Hughes & Luft, 1991) and expenses (McLaughlin, 1988b). Regional variation in legislative barriers to DCA development has also been found (Cooper & Green, 1991; Wellers,

1984). Regional variation is measured by a set of four dichotomous variables in which the hospital's SMSA is located. The four regions of the U.S., as defined by the U.S. Bureau of the Census (cited in Sullivan, Miller, Feldman & Dowd, 1992) are the northeast (**NRTHEAST**), north central (**NRTHCENT**), west (**WEST**) and south (**SOUTH**) which is used as the reference category given its historically lower rate of DCA penetration in these states. Appendix B shows the assignment of states to regions used in this study, and is consistent with the regional classification used by the AHA and HCFA.

Hospital Efficiency

The second and third research questions in this study consider hospital efficiency as a salient organizational attribute of growing importance in the new environment for cost effective managed care. The literature consistently proclaims the necessity for, if not the ability of, DCAs to select cost effective providers (Cobbs, 1989; Gabel, et al., 1988, 1986; Gold, 1991a; Goldsmith, 1988; Hester, 1987). Organizational inefficiency in providing (McLaughlin, 1988a) and administrating (Thorpe, 1992; Woolhandler & Himmelstein, 1991) health care produces higher health care costs than necessary. Organizational inefficiency is also considered tractable as providers are forced to become more efficient to compete for inclusion in, or independence from, DCAs (Chilingerian, 1992; Enthoven, 1978, 1988) or generally

respond to market signals in pursuit of profits (Ferguson & Posnett, 1991). This study specifically considers efficiency within the context of the organization, defined as the relationship between its use of input resources to produce given product or service outputs (Marchment & Hoffmeyer, 1991; McLaughlin, 1988a; Scott & Shortell, 1983). Allocative efficiency, or concern for the Pareto-optimal market outcome of how resources are allocated among and within firms is beyond the scope of this research (Arrow, 1963; Folland, Goodman & Stano, 1993; Mansfield, 1991).

Organizational efficiency, however, is multidimensional, and is often described by diverse performance measures including cost efficiency, productivity, production efficiency and technical efficiency, to name but a few. This study employs several measures for operationalizing organizational efficiency to increase the generalizability of findings, and to minimize methodological concerns about measurement bias (Cook & Campbell, 1979; Kerlinger, 1986). Hospital efficiency, as used in this study, is evaluated using four constructs: productivity, process efficiency, cost efficiency and technical efficiency. All measures are adjusted by the computed hospital's SEVERITY.

Productivity, or the relationship between labor inputs and service outputs is measured as the ratio of FTEs per adjusted occupied bed (FTEBED). The variable FTEBED in this study more precisely measures inefficiency, or non-productivity. The lower the computed value, the greater the hospital's efficiency in productively using labor resources. In this continuous measure, the number of beds is adjusted to

reflect the increasing use of outpatient services, and the actual usage of those beds (Sear, 1992). Productivity has increasingly become of concern as hospitals use greater and more diverse numbers of personnel resources to provide more clinical and human services of varying complexity while trying to contain operating expenses (Goldsmith, 1988). Although useful for relating hospital FTEs per adjusted occupied bed to accommodate the increasing emphasis on outpatient activity, the measure is still somewhat limited (Serway, Strum & Haug, 1987). The raw number of FTEs is ambiguous in that it does not reflect differences in skill or labor cost mix, nor the associated plant, supplies and technology required to support that labor mix. The variable **FTEBED** is used in this study because it has been accepted by the AHA in its Monitrend productivity tracking system, provides a relatively simple and readily available means of capturing a hospital's productivity, and can be consistently computed for all hospitals over all years under investigation.

Process efficiency considers the degree to which a hospital uses its services and technology to capacity, thereby maximizing output for given costs. Provan (1987), for example, found a hospital's efficiency as measured by its occupancy rate and average length of stay highly predictive of the institution's adoption of cost containment policies. This study operationalizes a hospital's process efficiency using two measures: its occupancy rate and average length of stay relative to other community hospitals in the local market (**ROCUP** and **RALOS**, respectively). Computed as the ratio of a hospital's occupancy rate to the average in its market, the

relative occupancy rate (ROCUP) reflects the degree to which staffed and licensed beds are being utilized during the year (Culhane & Hadley, 1992) relative to others in the same market. Occupancy also provides an indicator of the need for critical resources in terms of patients, especially from HMOs and PPOs (Dranove , 1986; Goldsmith, 1988; Higgens & Meyers, 1987; Melnick, et al., 1992; Staten, et al., 1988). Excess capacity in empty beds contributes to higher overhead expenses, which may be significant for larger hospitals (Pauly & Wilson, 1986). Lower relative occupancy rates suggest lower hospital efficiency and greater excess capacity relative to others in the MSA market. Excess capacity indicates relatively more critical need for patient resources. Excess capacity also indicates the inability of the hospital to take advantage of its scale of operations (Nutt & Miltner, 1992). The hospital's average length of stay relative to similar hospitals in the market (RALOS), delineates its ability to focus acute care services quickly and effectively, followed by prompt discharge to home or other less expensive care settings. RALOS is derived by dividing a hospital's computed average length of stay (i.e., the ratio of total annual patient days to total admissions) by the average of all community hospital lengths of stay in the market. The greater the hospital's RALOS relative to others in its market (after adjusting for SEVERITY), the lower is its process efficiency.

Cost efficiency (COSTEF) in this study is measured by the ratio of total hospital expenses per adjusted patient day. Favorable cost efficiency typically is reflected in the hospital's ability to elevate its productivity, process and technical

efficiency (e.g. Cleverly & Harvey, 1992; Nutt & Milter, 1992). Similar to **FTEBED**, higher values for **COSTEF** indicate inefficiency in a hospital's cost containment activities. The lower the hospital's **COSTEF**, therefore, the more efficient is its efficiency in managing costs.

Lastly, a hospital's technical efficiency (**TECHEF**) is operationalized by a continuous measure derived from the linear programming technique known as data envelopment analysis (DEA). Given the multi-product nature of the hospital (Ruchlin, 1977), technical efficiency represents a class of "total factor" efficiency that considers perhaps not all, but at least the salient resources of a hospital necessary for providing specific units of services (Grosskopf & Valdmanis, 1987). DEA provides a means for searching for optimal combinations of pre-selected inputs and outputs in a target sample of hospitals, and identifying those hospitals most efficiently producing the outputs given the inputs for comparison to all remaining hospitals in the sample (Charnes and Cooper, 1980). "Best practicing" hospitals are given a technical efficiency score of "1," and all other hospitals receive scores of less than one but greater than zero reflecting their efficiency relative to those "best practicing" ones defined on the "envelop" or frontier (Charnes, Cooper, Lewin, Morey & Rousseau, 1985; Morey, Fine, & Loree, 1990; Rosko, 1990). Sherman (1986) contends purchasers or their agents, such as PPOs, could use DEA to identify inefficient hospitals for exclusion from their networks.

This study uses DEA to create the composite technical efficiency score

(TECHEF). Similar to the other measures of efficiency, TECHEF is computed each year, so that a hospital that is technically efficient one year, may or may not be so the next. The measure is derived by considering simultaneously two outputs and four inputs. Outputs are measured by the number of adjusted admissions and total inpatient and outpatient surgical operations. Certainly, as others using DEA have noted (e.g., Ozcan & Lynch, 1992) hospitals produce other outputs including research, community services and training. But these two measures capture the major outputs produced by most hospitals and focus specifically on their technical core capabilities of inpatient acute care, while also reflecting the more recent diversification into outpatient services. Inputs are measured using the number of staffed and licensed beds to capture capital investment, total full and part-time FTEs for labor inputs, total non-payroll expenses to capture operating costs, and service complexity measured by the SERVMIX value. A hospital's technical efficiency is computed relative to its peers in terms of similarity in bed-size and geographic location as specified in Appendix C.

As specified, then, efficient hospitals are expected to have lower ratios of FTEs per occupied bed (FTEBED), higher occupancy rates relative to others in the same MSA market area (ROCUP), and lower average lengths of stay relative to the market (RALOS). Efficient hospitals are also expected to provide their services at a lower cost, adjusted for inflation (COSTEF) by optimally employing technically efficient production means (TECHEF) reflected in high values approaching 1 on a scale of 0 to 1.

Market Structure Characteristics.

The market for a hospital's services is considered a local phenomenon, because its services are produced and consumed locally (Pegals & Rogers, 1988), and usually confined to limited travel distances and accessibility (Burns & Wholey, 1992a and b). The importance of particular features in a hospital's local market in influencing its behavior has been well documented, especially with respect to the presence of other hospitals (e.g., Hughes & Luft, 1991). The practical definition of a hospital's market varies, depending on the focus of concern (Hilsenrath, 1991; Porter, 1980).

This study of hospital affiliation patterns defines hospital markets at the MSA level because DCAs typically contract for hospital services near their membership (Kralewski, et al., 1991), usually in highly populated, urban areas (Christianson, Sanchez, Wholey & Shadle, 1991; Deloitte & Touche, 1992; Gold, 1991b), irrespective of artificial political boundaries which may not reflect actual hospital utilization patterns (Morrisey & Ashby, 1982). Some MSAs are located in contiguous states, and thus cross state and regional boundaries. This phenomenon does not hinder this study since the focus of attention is on local market differences, within which the variables are measured. In some instances, however, when a hospital's occupancy rate or average length of stay is measured relative to others in its MSA-market, the focal hospital may be in one state and perhaps region, while local "competitor" hospitals might be in another, contiguous state or states.

Table 2 defines the four market variables used in this study, their measurement, and source of data, as well as an interaction term. Each of the market variables are used to assess the extent to which hospitals in competitive environments are more likely to affiliate with DCAs than those in less competitive environments (Hypothesis 8). The number of similar (e.g., community) hospitals in a market (HCOMP) is consistently used as a measure of external or competitive influence in a hospital's local market. Similar hospitals in the market indicates the degree to which the focal hospital might face competition on the basis of providing similar services (e.g., Hughes & Luft, 1991), bidding for contracts with DCAs (Mobley, 1992) or providing discounts (Kralewski, et al., 1992; Staten, et al.,1987, 1988). The number of similar hospitals appears to influence the strategic decision-making of hospitals as well (Ginn & Young, 1992).

Competition can also be assessed based on the extent to which hospitals compete over a finite number of patients. A hospital's patient market share (MKTSHR) is computed in this study as the ratio of its patient discharges to the total in its MSA. A hospital's MKTSHR provides a measure of autonomy relative to others in the market. MKTSHR, used in conjunction with a measure describing the extent to which the hospital has excess capacity requiring additional critical resources (ROCUP), provides a means for assessing the resource-dependent hypotheses derived from the prediction matrix in Chapter 3 (Hypotheses 4-8).

Table 2. Market Variables and Measurement

Variable Name	Measures
HCOMP	Hospital competition measured as the number of similar community hospitals in the MSA
MKTSHR	Hospital's market share in the SMSA, computed as the ratio of its patient discharges to the total in the MSA
HHI	The discharge-based Hirschman-Herfindahl Index (See Appendix D)
RAFIL	Relative percent of DCA affiliations in the MSA; computed as the ratio of the number of DCA linkages (Yes=1, No=0) to the total potential in the MSA (i.e. the number of similar community hospitals, or HCOMP).
Interaction term: ROCUP*MKTSHR	An interaction term in which the relative occupancy rate is multiplied by the hospital's market share

Note: all data are from the American Hospital Association Annual Hospital Survey computerized data files, 1984-1991.

The concentration of market shares among the hospitals in an MSA has also been used to capture the degree of local competition (Ginn, 1990; McCue & Ozcan, 1992; Zwanziger & Melnick, 1988). As found in studies of industrial concentration (Feldman, et al., 1990), the Hirschman-Herfindahl Index (HHI) provides a useful measure for capturing the extent to which hospitals may compete over limited resources. As used in this study, HHI is the sum of the square of the market share (based on discharges) of each hospital within the local market (see Appendix D for computations). The HHI value depends on the number of hospitals in the market and their relative market shares, and is influenced by differences in rural and urban

settings and other background factors (White & Chirikos, (1988). The values for the HHI range from 0 indicating significant competition where no single hospital dominates, to 1 where a hospital holds monopoly market share (Zwanziger & Melnick, 1988).

Competition over critical resources can also apply to hospitals seeking contracts with DCAs. A proxy measure of hospital competition for DCAs (RAFIL) is used to assess the degree to which others in the same market have pursued a similar strategy. That is, the focal hospital may be the only institution in the market pursuing affiliation, or it may be one of many. RAFIL is computed as the ratio of the focal hospital's DCA linkage (Yes=1, No=0) to the total in the MSA. Values for this measure range from a high of 1 where all hospitals in the MSA have affiliated, to a low of 0 when no hospitals in the MSA are affiliated.

Lastly, an interaction term is evaluated, operationalizing the interaction of the constructs autonomy (measured by market share) and criticality of resource needs (relative occupancy rate in the market), defined as ROCUP*MKTSHR to permit a more integrated evaluation of the resource dependent prediction matrix shown in Chapter 3 and hypotheses 4-7. As defined earlier, hospital occupancy rates provide a measure of excess capacity, and hence the need for patient resources, where the lower the occupancy, the greater the resource need. Also, the greater the hospital's share in the local market, the more likely it can pursue autonomous strategies. Thus, the hypothesis that "hospitals with low resource need and high autonomy relative to

others will be less likely to affiliate with either DCA" (Hypothesis 4) can be evaluated as: "The higher a hospital's occupancy and the greater its market share, the more likely the hospital will not affiliate with either an HMO or a PPO."

Sample Design

The research sample was restricted to all community hospitals operating since 1983 in U.S. metropolitan statistical areas (MSAs) where DCA affiliations were possible. Urban community hospitals in MSAs have represented the bulk of American hospital care in the U.S. and have been used extensively in the literature as the organizational unit of analysis. Urban community hospitals have also been more likely to face the competitive pressures of managed care than other hospital types. Restricting the sample to urban hospitals also avoided confounding the Hirschman-Herfindahl Index computed as a measure of the competitive market structures in which the sampled hospitals operate (White & Chirikos, 1988).

Community hospitals have been defined as those nonfederal short term institutions (less than 30 days average length of stay) offering general and other specialty services to the public (AHA, 1992, "Guide", p. A4). The U. S. hospital industry in 1990 comprised 6,710 hospitals registered with the American Hospital Association (AHA, 1992, "Hospital Statistics"). The majority of these hospitals (5,384, or 80%) were classified by the AHA as "community hospitals." Community

hospitals have employed almost three-fourths (70%) of the total hospital work force (National Center for Health Statistics, 1992), with over half of the hospitals located in urban areas (AHA, 1992, "Hospital Statistics").

The target sample was further restricted to hospitals located in MSAs because DCAs have focused developmental efforts in highly populated areas (Gold, 1991a, 1991b; Harrington, Newcomer & Moore, 1988; Morrisey & Ashby, 1982). Although only slightly over half of all community hospitals were located in urban communities in 1990, urban hospitals operated close to 75% of the beds, consumed 88% of the expenditures, and admitted 82% of the patients managed by community hospitals (AHA, 1992, "Hospital Statistics).

Urbanization, in this study, was based on the metropolitan statistical area, defined as a "city or urbanized area of at least 50,000 population, with a total metropolitan area of at least 100,000" (U.S. Office of Management and Budget, cited in AHA, 1992, "Hospital Statistics"). The MSA has been considered reflective of the geographic distribution and proximity of a hospital's potential patient market because it includes at least one county containing the central city of at least 50,000 inhabitants, as well as the contiguous counties, which are socially and economically integrated with the central city (U.S. Bureau of the Census, cited in Anderson, et al., 1985). MSAs, therefore, include those counties with populations commuting to work in the focal city, and, for which hospitals might vie to provide services. The sample therefore excluded hospitals in rural areas. The sample did include the range of

services found in most hospitals, as well as affiliation with the Council on Teaching Hospitals, medical schools, residency programs and multi-hospital systems. These hospitals ranged in size from 6 beds to over 1700 beds, and were generally representative of the AHA-reporting national mix of public and private, for-profit and not-for-profit institutions.

To compare affiliating and non-affiliating hospitals appropriately, the sample was also reduced to ensure hospitals, in fact, had the prerogative of contracting with DCAs or not. In each annual sample, all hospitals were omitted in those states where either HMOs or PPOs reported no membership that year. As a result of this methodology, hospitals in 22 states were omitted in the 1984 sample (6 without HMOs and 21 without PPOs which included 5 of the same states without HMOs). By 1991, the number of states without DCA presence had decreased to only 4, due entirely to the absence of HMO membership in those states. Appendix E lists the states excluded from analysis each year for the period 1984-1991.

Given the focus of the second and third research questions on the organizational and market factors associated with hospitals initially affiliating with DCAs, hospitals that had previously affiliated were removed from the study of incidence to control for differences in history and maturation (Cook & Campbell, 1979). Controlling for maturation and history bias was necessary because of the concern that previously affiliated hospitals (accruing, perhaps, from symbiotic relationships with DCAs) might operate differently from others that had not yet

pursued affiliation. The threats of differing maturity and history were controlled by removing from the analysis, or "left censoring" (Allison, 1990), those hospitals in 1985 having prior affiliations in 1983 and 1984. In this manner, all hospitals examined in 1985 were similar, in that none were affiliated with a DCA in the previous year. The data were similarly left censored for the analyses of subsequent years as well. Hospitals were not removed from the sample for analyzing the prevalence of hospital affiliation.

Data Sources

Three sources of data were used in this study: The American Hospital Association's (AHA) Annual Surveys of Hospitals computerized database (1983-1991), the U.S. Bureau of the Census (Statistical Abstract) and a combination of HMO and PPO survey reports from Marion Merrell Dow and the American Medical and Care Review Association. The AHA annual surveys provided measures of the dependent variable, the affiliation event (presence or absence of HMO and PPO contracts), as well as measures of hospital and market attributes. Between 1984 and 1987 the AHA asked hospitals to respond with either a "yes" or "no" to two questions pertaining to DCA affiliations (with wording differing only in referencing HMOs or PPOs): "Does the Hospital provide treatment to health maintenance organization (preferred provider organization) members on a basis other than emergency or out-of-area care?"

Apparently in response to the trend in increasingly formalized contracts between hospitals and DCAs, the AHA modified these questions beginning with their 1988 survey. The revised questions asked: "Does the hospital have a formal written contract with a health maintenance organization (preferred provider organization) that specifies the obligations of each party?" Affirmative responses to either question were considered in this study as indicative of hospital affiliation.

The AHA annual survey data has been the most recognized source of information on individual hospitals (Provan, 1988), and the basis for hospital information in the U.S. Bureau of the Census' Statistical Abstract of the United States. AHA annual survey data have been extensively used in studies focusing on the hospital as the organizational unit of analysis and are well documented with respect to their strengths and weaknesses (Alexander & Morrisey, 1989). These data have typically been somewhat limited, however, because they have included only the hospitals registered with the AHA that have responded to the organization's annual surveys. Although the AHA has reported that their data slightly understates investor owned and smaller hospitals with fewer than 25 beds (AHA, 1992, "Hospital Statistics"), the survey has continued to offer the only national sample in the public domain differentiating, by hospital and over time, affiliations with either HMOs or PPOs.

Health care costs in general, and especially during the 1980s, have increased dramatically. To adequately compensate for changing costs over time and to compare

a hospital's relative costs before and after affiliation, all cost data were adjusted using the hospital room rate component of the consumer price index (CPI). As the primary cost of living index used by the federal government over the past fifty years, the CPI has been useful to compensate for the effects of inflation, and focused especially on the actual spending habits of urban consumers (Mansfield, 1991, pp. 96-102). Mansfield has noted, however, that while periodic efforts have been made to revise the "market basket" on which the index has been based to compensate for changes in technology, quality, etc., such adjustments have been difficult and usually crude, and have usually overestimated the rate of inflation. Data from this second source (shown in Appendix F) were provided by the U.S. Bureau of the Census (1991, 1992, "Statistical Abstract"), and were used to express costs in constant 1982 dollars.

A combination of Marion Merrell Dow (HMO and PPO Digests) and the American Medical Care and Review Association for the years 1983-1991 provided the third source of data for the present study. These data identified the presence of membership in an HMO or a PPO at the state level, and were used to ensure the analysis focused only on those hospitals with the opportunity for affiliating with either entity. Because this study examined the extent of variation in hospital affiliation strategies, hospitals were excluded from analysis in states where either DCA form was absent (as opposed to those much fewer states where both forms were absent).

Analytic Strategy

The analysis initially addressed whether the sample adequately represented all urban-based community hospitals in the U.S. While hospitals not responding to the AHA survey were expected to differ somewhat from responding hospitals, non-responsiveness was expected to be unrelated to the issue of affiliation under study. After determining sample for representativeness of the general hospital population, the prevalence of hospital affiliations was examined to identify the extent to which affiliations with DCAs had changed over the 1984-1991 period. Profiles of hospital characteristics were developed distinguishing between hospitals affiliating or not with DCAs, and, among those affiliating, distinguishing those affiliating with HMOs, PPOs or both.

The extent to which hospital and market factors have influenced hospital affiliations with DCAs (second and third research questions) was evaluated by analyzing prevailing hospital affiliations first, followed by analysis of the smaller sample of hospitals affiliating for the first time. These hospital factors were examined in detail across three selected points in time (1985, 1988 and 1991) first by univariate analysis of means and non-parametric tests, followed by more rigorous multivariate analysis controlling for the influence of all other independent variables. The degree to which explanatory variables were correlated with others or with any linear combination of others, or multicollinearity, was assessed prior to employing

multivariate analysis. Remedies for limiting the effect of multicollinearity were considered and applied, while maintaining the basic integrity of the proposed model of affiliation.

Univariate Analysis and Non-Parametric Tests

The significance of the differences in variable means was evaluated using non parametric test statistics because no parametric error structure was included in the model, nor were assumptions made regarding a normal distribution of the data (Burns & Wholey, 1991; Neter, Wasserman & Kutner, 1985). The only assumption required about the population distributions is that they are continuous and have approximately the same variability in terms of skewness, etc., while they may differ in the location of the mean. Non-parametric tests assume samples are drawn independently and randomly (Neter, Wasserman & Kutner, 1985). This study uses the entire target population (i.e., a census) rather than random selection, and relies on disaggregating that census into naturally occurring groups to satisfy the independence requirement. The Wilcoxon 2-sample test is appropriate for testing the mean rankings of two samples, such as between respondents and non-respondents, between affiliating and non-affiliating hospitals, and between hospitals affiliating and not affiliating with HMOs.

Multivariate Logit Analysis

A number of multivariate techniques relying on ordinary least squares estimates of linear models are useful for analyzing the influence of multiple predictor and control variables. Loglinear models, however, are more appropriate for regressing a dichotomous dependent variable on a relatively large number of explanatory variables considered simultaneously and measured on different scales (Breslow, 1990; Dillon & Goldstein, 1984). Loglinear models have increasingly been used for analyzing models involving qualitative choice, where the data are not normally distributed. Studies of hospitals involving logistic response models have addressed hospital strategy formulation (Ginn, 1990), why hospitals give discounts to HMOs (Kralewski et al., 1992), why HMOs select particular hospitals (Feldman, et al., 1990) and how HMOs affect hospital finances (Feldman et al. 1986).

The logit model is particularly applicable for estimating the cumulative logistic probability function when the dependent variable is binary such as the occurrence or non occurrence of an event (Breslow, 1992; Cleary & Angel, 1984). Pindyk and Rubinfeld (1981, p. 287) specify the probability function as:

$$P_i = F(Z_i) = F(\alpha + \beta X_i) = 1/ (1 + e^{-z_i}) = 1/ (1 + e^{-(\alpha+\beta X_i)})$$

where, in this study:
P = probability of affiliation (1), given X; i = an individual hospital;
F = the cumulative density function; Z = standardized normal value;
X = parameter or characteristic of the ith hospital;
e = base of natural logarithms, or approximately 2.718.

By transforming the problem of predicting probabilities within a zero to one interval to that of predicting the odds of affiliation occurring, the function can be used to estimate the logarithm of the odds a hospital will affiliate:

$$\log P_i/(1-P_i) = Z_i = \alpha + \beta X_i$$

Using the above model in this analysis, where affiliation is valued at 1 and non-affiliation at 0, the specified odds ratio is the ratio of the probability of affiliation (P_1) to the probability of no affiliation (P_0). An odds ratio greater than one indicates a factor contributes to affiliation, while an odds ratio less than one indicates the factor does not contribute, relative to the other variables. This technique uses maximum-likelihood estimation for determining the relative odds of affiliation. It is similar in form to ordinary least-squares regression (OLS), except coefficients are interpreted as the logarithm of the odds of affiliation occurring given the specified explanatory variables.

Logit has been used for analyzing the determinants of hospital contracts with insurers (Mobley, 1992), for understanding why hospitals engage in resource dependence-creating management contracts (Alexander & Morrisey, 1989), and for examining the financial characteristics of hospitals purchased by investor-owned chains (McCue & Furst, 1986). Logit has also been employed to model provider decision making such as in physician choice of hospital (Burns & Wholey, 1992b) or first job location (Wilensky & Rossiter, 1978). The statistical technique provides standardized regression coefficients and individual odds ratios for identifying the magnitude of an

affect for each explanatory variable relative to the other explanatory variables, and p-values reflecting the relative influence and significance of each. Model fit statistics are provided by chi-square, non parametric statistics.

Summary

This chapter presented the methodology for this research. The multi-year samples were examined for trends in hospital affiliations over time (first research question), for both prevailing as well as new affiliations. Profiles of key hospital attributes were developed from these trends to differentiate those hospitals that have most frequently affiliated with DCAs from those that have not, and, among the affiliating hospitals, to differentiate those affiliating with HMOs (and those not), those affiliating with PPOs (and not) and those affiliating with both DCA forms. Non-parametric and logit multivariate analyses were used to identify the extent to which hospital affiliations with DCAs were influenced by selected market and hospital factors, especially efficiency measures. Identification of significant determinants of affiliation which provide hospitals with critical resource exchange relationships were then used to support or reject the hypothesized relationships derived from the theoretical structure of resource dependence. A discussion of the results of these analyses is provided in Chapter Five.

CHAPTER 5
RESULTS

This chapter presents the empirical results of the univariate and multivariate analysis of hospital-level affiliations with DCAs between 1984 and 1991. Results are provided in the same order as the research questions. A series of charts using a number of commonly accepted organizational features describe the prevalence of hospital-DCA affiliations in response to the first question. After examining the descriptive statistics of the prevalence sample, the scope of affiliations is explored in more detail based on the hypothesized independent variables as they relate to the four binary dependent outcomes: the prevalence of affiliations with any DCA (AFIL), and, among those affiliating, affiliations with HMOs, with PPOs, or with both. The association between the modeled organizational and market variables and each of the four dependent variables is first assessed generally based on non-parametric univariate tests and bivariate correlations, and is then supplemented by multivariate logit analysis.

Because the second and third research questions focus on the incidence of new affiliations, the final stage of the analysis highlights the trends in new affiliations and then presents the results of univariate and multivariate logit analyses.

Descriptive Analysis of Study Hospitals

The final sample used to analyze the prevalence of hospital-DCA affiliations averages 2,584 hospitals per year during the 1984-1991 time frame, as shown in Appendix G (Column 7). Annual sample sizes ranged from a low of 2,114 hospitals in 1984 to a high of 2,701 in 1987 as a result of the sampling strategy outlined in Chapter 4 (i.e., restricted to those U.S. community hospitals in urban areas within states where HMOs or PPOs provided services to members). The annual samples were also reduced due to coding anomalies found in the AHA data base (an average of about 40 hospitals each year), and due to hospitals failing to respond to either AHA survey question on HMO or PPO involvement (an average of 249 hospitals each year). The final sample size represents over one-third (37%) of all AHA member hospitals, and nearly one-half (46%) of all U.S. community hospitals, ranging from a low of 36.2% in 1984 to a high of 48.9% in 1990.

Generalizability of the Sample

Table 3 shows the means and standard deviations of the 1984 and 1991 sample hospitals and compares them to those of the general U.S. hospital population. The table shows a large degree of variability in the range of the variables, with many having standard deviations in excess of twice the mean. The sample and population variable means were all significantly different, as measured by the Wilcoxon

Table 3. Descriptive Statistics: Comparison of Study Sample to All U.S. Hospitals

Hospital Attributes	1984 Study Hospitals (N = 2,114) Mean (sd)	1984 U.S. Hospitals (N = 6,273) Mean (sd)	1991 Study Hospitals (N = 2,625) Mean (sd)	1991 U.S. Hospitals (N = 5,934) Mean (sd)
Public	0.14 (0.35)	0.26 (0.44)	0.13 (0.34)	0.23 (0.42)
Private, Not-for-Profit	0.73 (0.45)	0.54 (0.50)	0.71 (0.45)	0.54 (0.50)
Private, Investor-Owned	0.13 (0.34)	0.20 (0.40)	0.16 (0.36)	0.24 (0.42)
System Affiliation	0.39 (0.49)	0.34 (0.47)	0.47 (0.50)	0.38 (0.49)
Contract Managed	0.08 (0.27)	0.11 (0.31)	0.07 (026)	0.11 (0.31)
Alliance Member	NR	NR	0.32 (0.47)	0.21 (0.41)
Size (No. of Beds) % Small Hospitals (1-99 beds) % Medium Hospitals (100-299 beds) %Large Hospitals (300+ Beds)	270 (202) 0.2 (0.40) 0.45 (0.50) 0.36 (0.48)	175 (182) 0.47 (0.50) 0.35 (0.48) 0.18 (0.38)	254 (196) 0.20 (0.40) 0.48 (0.50) 0.31 (0.46)	170 (174) 0.47 (0.50) 0.37 (0.48) 0.16 (0.37)
Patient Days	83,615 (71,242)	51,660 (61,105)	83,877 (72,527)	53,542 (62,346)
FTEs	881 (858)	517 (695)	1,056 (1,031)	637 (841)
Occupancy Rate	0.67 (0.16)	0.60 (0.18)	0.63 (0.17)	0.56 (0.19)
Average Length of Stay	7.43 (3.00)	7.75 (4.80)	7.36 (3.88)	8.53 (5.71)
SEVERITY Index	0.07 (0.07)	0.04 (0.06)	0.10 (0.10)	0.06 (0.08)
SERVMIX	0.57 (0.21)	0.44 (0.25)	0.65 (0.19)	0.51 (0.26)
Presence of Residency Program	0.32 (0.47)	0.18 (0.38)	0.34 (0.47)	0.19 (0.39)
No. of Residents	22.0 (65.0)	11.1 (45.3)	24.0 (77.4)	12.8 (55.3)
Member, COTH	0.13 (0.34)	0.07 (0.26)	0.04 (0.19)	0.02 (0.15)
Medical School Affiliation	0.30 (0.46)	0.16 (0.37)	0.30 (0.46)	0.17 (0.37)
JCAHO Accreditation	0.91 (0.28)	0.75 (0.43)	0.92 (0.27)	0.79 (0.41)

NR- Not Reported or surveyed by the AHA in 1984

Sample and population variable means were all significantly different, in 1984 and 1991, as measured by the Wilcoxon 2-Sample Test (normal approximation, with continuity correction of .5, probability > |Z| = 0.0001) and the Kruskal-Wallis Chi-Square Approximation Test (probability > Chi-Square = 0.0001).

2-Sample Test (normal approximation, with continuity correction of .5, probability > |Z| = 0.0001) and the Kruskal-Wallis Chi-Square Approximation Test (probability > Chi-Square = 0.0001). Compared to U.S. hospitals in general, a higher proportion of the sampled community hospitals were private, not-for-profit,

while a lower proportion were public-owned or for-profit. While the study hospitals were more frequently involved in multi-hospital systems and alliances, there were fewer involved with management contracts than the general population. Compared to all hospitals, the sampled community hospitals were, on average, larger in bed size and associated inpatient workload volume and labor resources, averaged higher occupancy rates and provided a larger mix of services for patients with greater severity. With twice as many large hospitals (having over 300 beds) and half the number of small hospitals (having less than 100 beds), a greater proportion of the community hospitals were involved with medical education, in terms of having a residency program or in the number of residents trained, having medical school affiliation, or having membership in the Council of Teaching Hospitals (COTH).

Table 3 also shows that the study group and U.S. hospitals in general have followed similar trends over the eight years. Specifically, the two groups have increased the number of staff and the mix of services offered for patients with greater severity, while reducing the number of staffed beds as inpatient service utilization declined (e.g., patient days and occupancy rates). They have similarly reduced their membership in the COTH, but increased affiliations with multi-hospital systems and accreditation by the JCAHO. During the period under study, community hospitals slightly decreased their average length of stay, while the average for all U.S. hospitals had actually increased slightly.

The study sample was also examined to determine the magnitude of response bias for hospitals failing to answer either of the two AHA survey questions pertaining

to HMO or PPO involvement (Appendix H, Table H-1). The Wilcoxon 2-sample non-parametric test of significance was used to test the null hypothesis that the means of the two groups were equal for hospitals in 1984 and again in 1991. Results were substantiated by both Kruskal-Wallis Chi-square approximation and Savage 2-Sample tests. While the data reflected differences between the responding and non-responding groups, these differences were consistent with the usual response patterns reported by the AHA. For example, similar to the findings in the present study, the AHA has generally noted less responsiveness from smaller hospitals, those that are investor-owned or state and local government institutions, and those located in the West (AHA Hospital Statistics, 1992, p. xxxiii).

The literature has offered no theoretical foundation for suggesting a hospital's propensity to respond to the survey questions would be related to its particular strategy for affiliating or not. Because hospitals knew the AHA surveyed its membership annually for routine data describing many, perhaps unrelated institutional activities, there was no reason to suspect any bias in response associated with the survey methodology, due either to "observer" or "instrument" bias (Campbell & Stanley, 1963; Cook & Campbell, 1979; Kerlinger, 1986; Polit & Hungler, 1991).

The sampling strategy used in this study was therefore biased to the same degree the overall AHA data have been biased, but not to a degree affecting the scope and nature of this study. While the sample data lend support for generalizing findings of this study to the U.S. urban community hospital population, they also indicate caution should be exercised in extending any conclusions to the general population.

The implications of any findings, however, reflect the majority of U.S. hospital resources used (e.g., beds, staff and mix of services offered), and output produced in the United States (e.g., inpatient days, residents trained, etc.).

Intercorrelation of Study Variables

The degree of multicollinearity among the independent variables was assessed initially using data from 1984. Substantial multicollinearity can result in highly unstable estimated regression coefficients. Without remedial action, the degree of unreliability requires greater latitude in accepting the coefficients as significantly different from zero, and thus weakening discrimination between true and false hypotheses and consequently, the power of the model tests (Kmenta, 1986, p. 442). Spearman rank order correlation coefficients were examined as an initial screen for multicollinearity because Pearson product moment correlations tend to underestimate the relative covariance of categorized measures (Bollen, 1989), .

Analysis of the intercorrelations of all study variables was based on data from 1984 because it that was the first year of the sampled data, and the relationships between the independent and dependent variables were critical in the multivariate models used later in the study for examining the factors associated with the incidence of new (first time) affiliations using one-year lagged independent variables. Additionally, the bivariate relationships found in 1984 were generally replicated in the 1985 and 1991 samples as well, although inter-correlations were slightly lower in

these two years given the larger sample sizes (approximately 2,600 each) compared to 1984's (about 2,100, or 25% smaller).

The bivariate correlations (shown in Appendix H, Table H-2) indicated there was a high degree of multicollinearity among the candidate independent variables within the particular sample chosen (Dillon & Goldstein, 1984). There was a high degree of association, for example, between **SEVERITY** and four of five efficiency measures: **FTEBED** ($r = -0.95$), **ROCUP** ($r = 0.86$), **RALOS** ($r = -0.79$) and **COSTEF** ($r = -0.90$). The preferred remedy for reducing the degree of multicollinearity, that of increasing the sample size to yield greater informational content, was not selected because that course would require adding hospitals the literature indicates have historically not affiliated with HMOs or PPOs as much as their urban counterparts (e.g., federal, rural or long term care hospitals). The increased sample size, while perhaps helpful in reducing multicollinearity, would have biased the findings through over-representation of institutions that have not faced the same pressures for affiliating with managed care networks. Elimination of one or more of the collinear explanatory variables was therefore used to reduce estimation concerns and to improve interpretation of subsequent findings.

Following Kmenta's (1986) suggestions for assessing the degree of multicollinearity, each explanatory variable was regressed (using ordinary least squares) on the remaining explanatory variables to determine the extent to which the variables were linearly related. Other factors were considered in evaluating collinear relationships, including the variable's condition number (the ratio of its largest to

smallest root determinants, its variance inflation factor, whether coefficient signs (positive or negative) were different than expected, or the extent to which coefficient values changed as other explanatory variables were added to the model. As a result of these considerations, two variables were removed from the models: SEVERITY and RALOS. Removal of these variables substantially reduced the collinearity problems among several variables. Unfortunately, others, such as MKTSHR (R^2= .87), HHI (R^2= .79) and the interaction term (ROCUP*MKTSHR, R^2= .77) still reflected substantial collinearity. These variables were retained due to their contribution to the underlying theory of this study. Interpreting the significance of their coefficients in subsequent multivariate analysis therefore required broad latitude.

TECHEF was expected to be somewhat correlated with other predictor efficiency variables because it was structured to capture the critical inputs and outputs of hospitals which were only partially captured by the other measures of efficiency. Examination of TECHEF did not reveal any serious problem with collinearity with other variables, either through correlation analysis, or by regressing the variable on the other predictor variables.

The association between this study's use of SEVERITY and HCFA's case mix index was also examined prior to beginning the analysis. Using comparable hospitals reporting to the AHA in 1991, these measures were more associated ($r = 0.52$, $p \leq 0.0001$ where $n = 4493$) than found by Shortell and Hughes (1988) in their analysis of 981 hospitals in 1984 (where $r = 0.42$). The SEVERITY measure was found to be relatively consistent over time as well, between 1984 and 1991 ($r = 0.52$, $p \leq 0.0001$

where n=4424). While SEVERITY was removed from the model as a variable, the measure was still incorporated in all efficiency variables to adjust for differences in patient acuity.

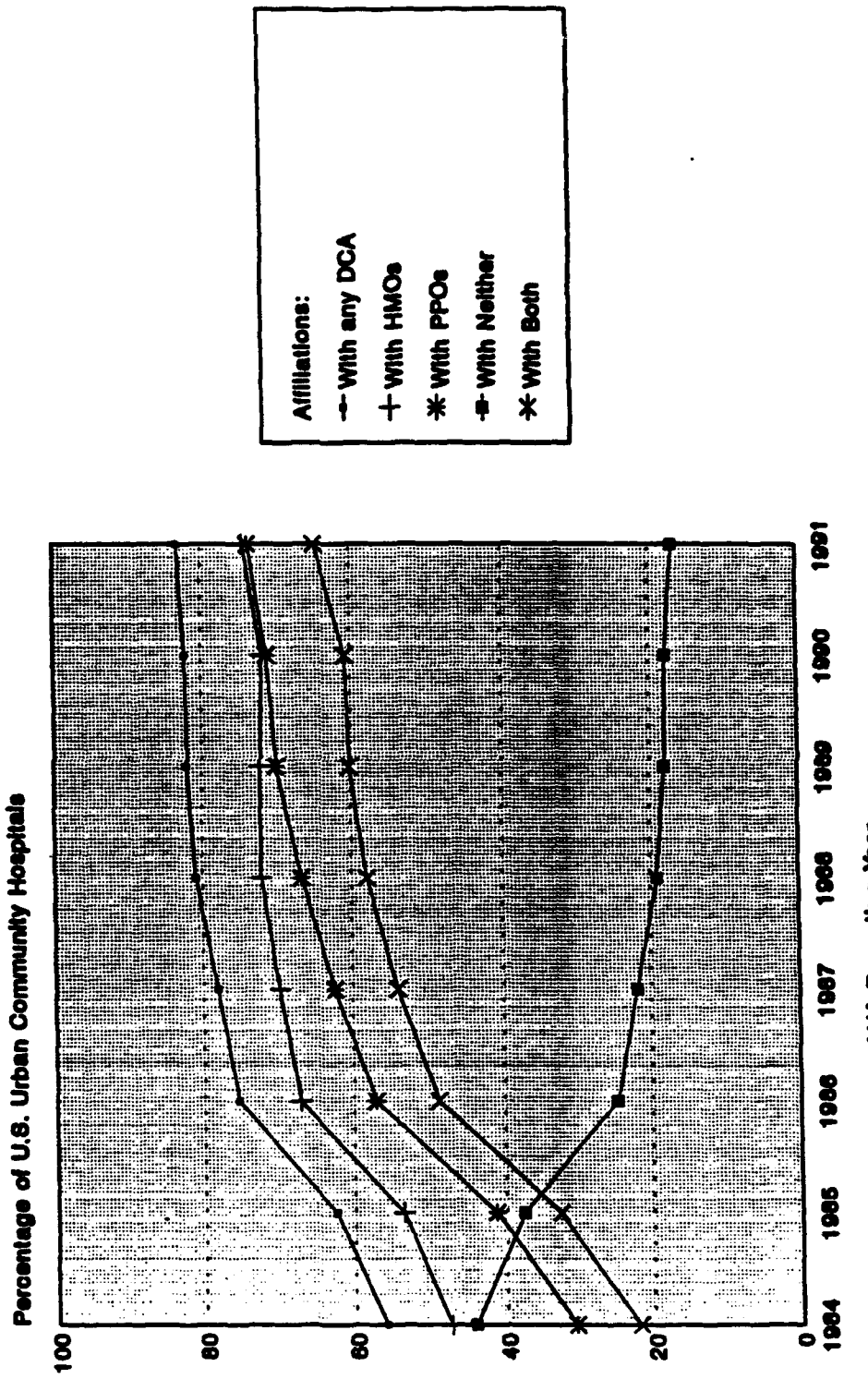
Prevalence Analysis

Trends in Prevalence of Affiliation

Responding to the first research question, "how has the scope of hospital affiliation with DCAs changed over the past decade?", longitudinal data are presented in a series of graphs portraying the nature of urban community hospital affiliation trends for the 1984-1991 period. These graphs portray the annual point prevalence of existing hospital-DCA relationships using several common features for classifying hospitals.

Figure 5 (with supporting data in Appendix I, Table I-1) shows the relative proportion of community hospitals affiliating with different DCAs (AFIL) as a

Figure 5.
Prevalence Trends in Hospital-DCA Affiliations (1984-1991)



percentage of the sampled community hospitals each year. The graph empirically supports the claims drawn from the normative literature that community hospitals have increasingly affiliated with DCAs since 1984, with fewer hospitals avoiding any such affiliation. For example, between 1984 and 1991, the percentage of community hospitals affiliating with either DCA form grew from 56% to over 83%, while those not affiliating with either form declined from 44% to about 17% during the same period. The relative proportion of hospitals affiliating with HMOs, with PPOs, or with both in a given year similarly increased between 1984 and 1991.

These data also reflect several points not previously addressed in the empirical literature. First, while more community hospitals affiliated with HMOs than PPOs in 1984 (47% and 39%, respectively), those affiliating with PPOs have increased at a greater rate, essentially reaching parity by 1991 with those affiliating with HMOs. Second, hospital affiliations with both DCA forms have paralleled the growth in hospital-PPO relationships. The growth in exchange relationships obviously matches the explosive growth in membership in both HMOs and PPOs during the early to mid 1980s, especially for the majority of PPOs emerging later than HMOs. Still, the phenomenon portrayed in the figure clearly indicates hospitals have not necessarily substituted relationships with PPOs for HMOs, but have instead sought to expand their linkages to managed care networks by affiliating with both.

A third point absent from the current empirical literature can be inferred from Figure 5. It shows a rather typical developmental or life cycle pattern in which the rate of affiliations, while explosive in the early 1980s, reached a plateau by the late

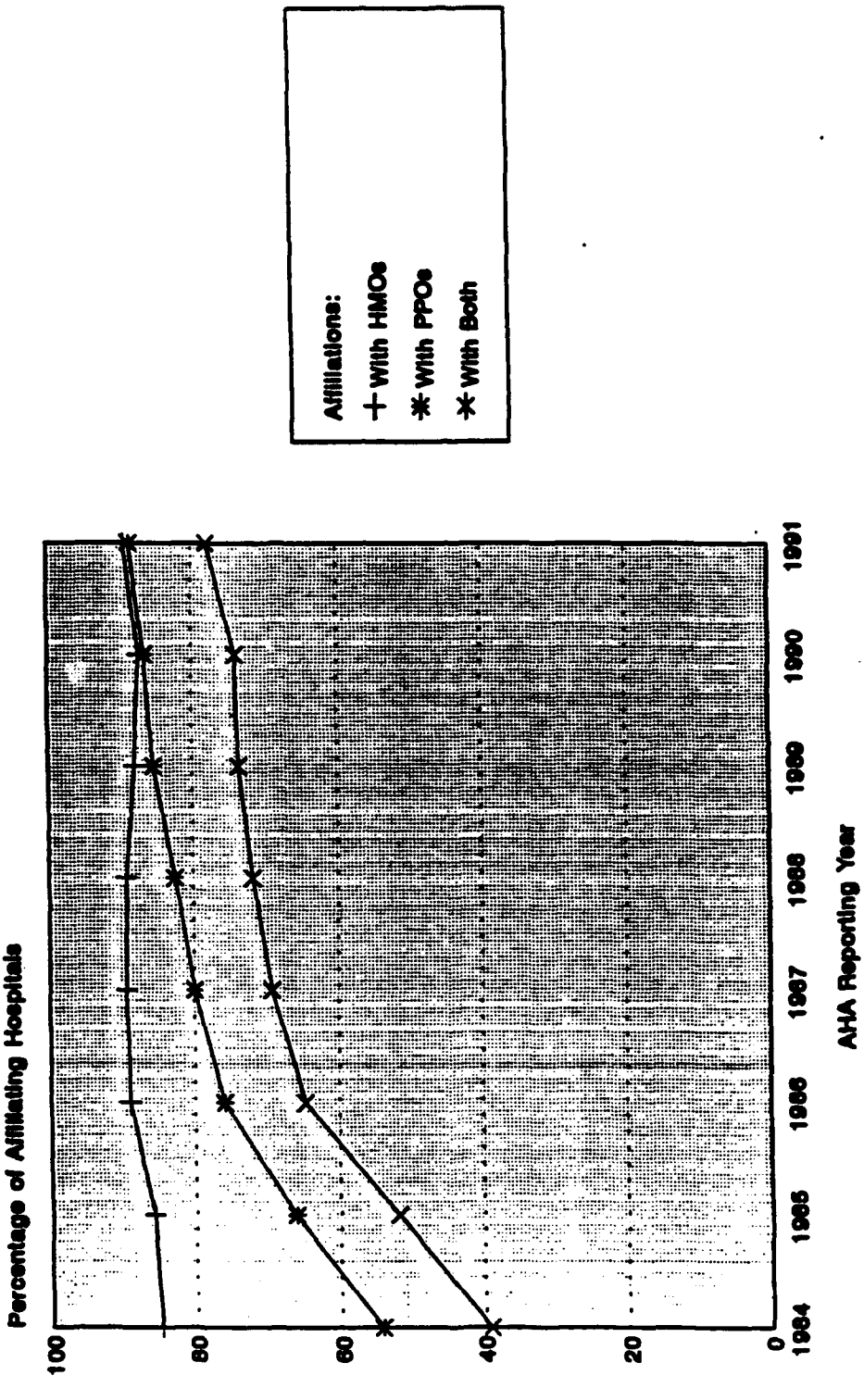
1980s. While hospital linkages increased tremendously between 1984 and 1986, the rate of growth markedly slowed during 1987, and, for affiliations with HMOs, leveled off by 1988.

These trends become even clearer when these data are expressed as a percentage of all hospitals affiliating with a DCA (AFIL), rather than a percentage of all community hospitals, as shown in Figure 6. Among affiliating hospitals, the proportion of those linking with HMOs remained essentially the same over the seven year period. Those choosing to affiliate with PPOs or with both clearly increased.

The graphs also support cross-sectional examination of the factors influencing affiliation across at least three points in time: in 1985 when the growth began to increase at the fastest rate; in 1988 when the rate of growth in affiliations appear to reach a zenith; and in 1991 to conclude the study with the most current data, and to provide clues where future trends might go.

Figures 5 and 6 also portray the extent hospital-DCA affiliations have become pervasive in the industry. This trend towards pervasiveness has been suggested in the literature based only on recent surveys, but has not been empirically shown. The figures show that while almost half (44.1%) of all community hospitals in 1984 avoided, or were unable to participate in, contractual relationships with both HMOs and PPOs, few were able to do so by 1991, with only about 17% not affiliated (Figure 5). The magnitude of this change strongly supports the contention that DCA affiliations have moved from peripheral strategies to "mainstream" strategies designed to enhance hospital distribution systems.

Figure 6.
Prevalence of Hospital-DCA Affiliations (1984-1991)
As a Percentage of Affiliating Hospitals

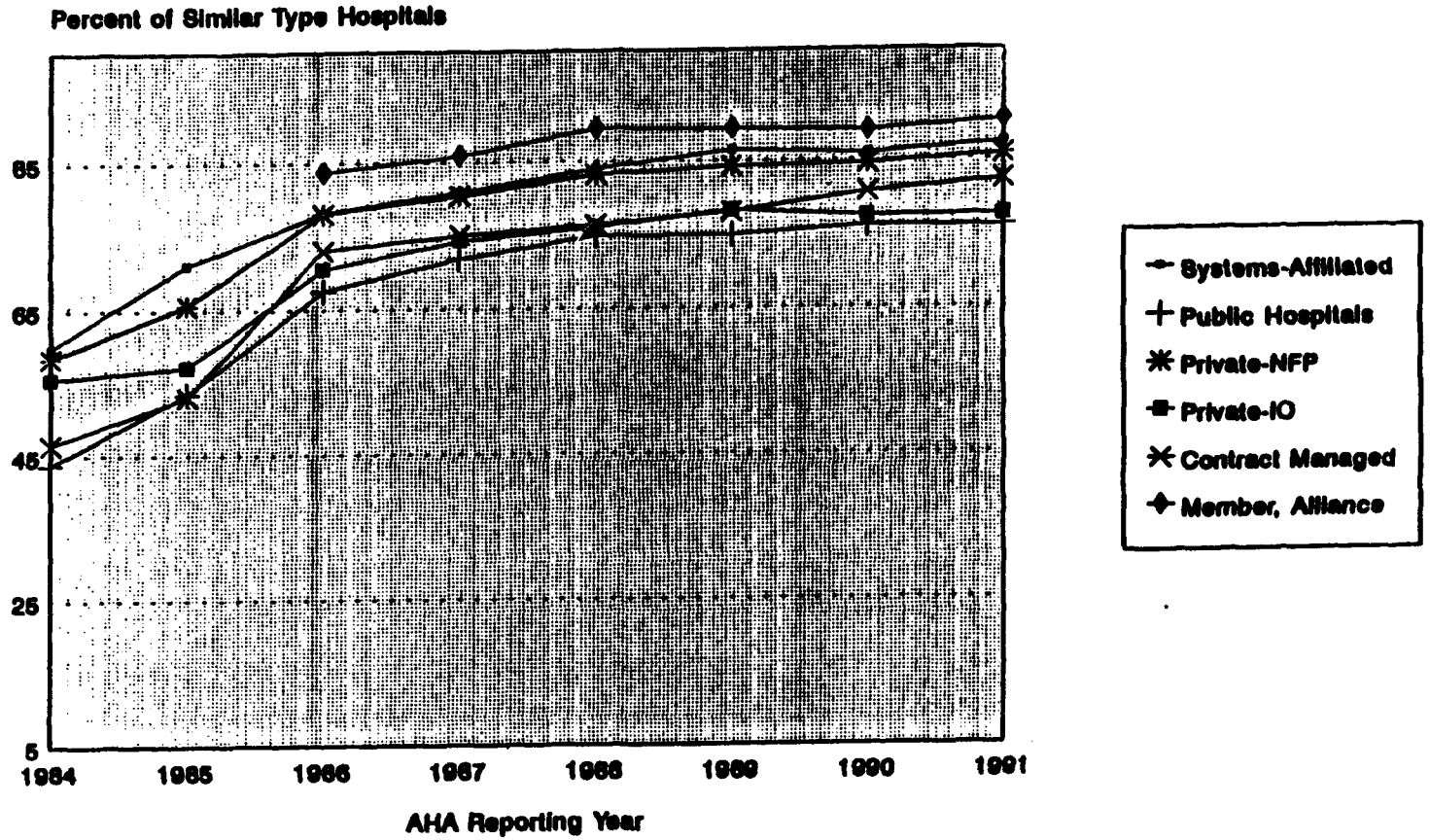


As can be seen from Figures 7 and 8, at the aggregate level of analysis, hospitals of all kinds have generally engaged in affiliations with DCAs in similar fashion: increasing dramatically between 1985 and 1986 and leveling off by 1988. The figures depict the trends in hospitals affiliating with either DCA form (AFIL) as a percentage of similar-type affiliating hospitals. Thus, while about 65% of all private, not-for-profit community hospitals were affiliated with DCAs in 1984, by 1991 85% had pursued that strategy. The shallow, "S" or sigmoid-shaped growth curves were remarkably similar for different types of hospitals, irrespective of ownership, profit orientation, bed size, medical education, contract management and alliance membership. By 1991, nearly 85% of most types of hospitals were affiliated with a DCA. Hospitals under contract management have shown the fastest increase in affiliations, while others have been slower to affiliate, such as investor-owned, public, and small hospitals with less than 100 beds.

The shallow "S"-shaped growth pattern in the prevalence of affiliations at the aggregate level was also replicated when hospitals were examined for their affiliations with HMOs, with PPOs, or with both. Representation in prevailing hospital-DCA relationships among the different ways of classifying hospitals has changed little during the eight years. Large and not-for-profit hospitals, or members of alliances and the COTH have shown great proclivity in affiliating with DCAs in general, and with HMOs, PPOs and with both specifically. Small, public, and investor-owned hospitals have similarly increased their affiliations with DCAs, but to a lesser extent than large, non-profit, alliance and

Figure 7.

Prevalence of Hospital-DCA Affiliations By Ownership and Other Associations
As a Percentage of Similar Hospital Type

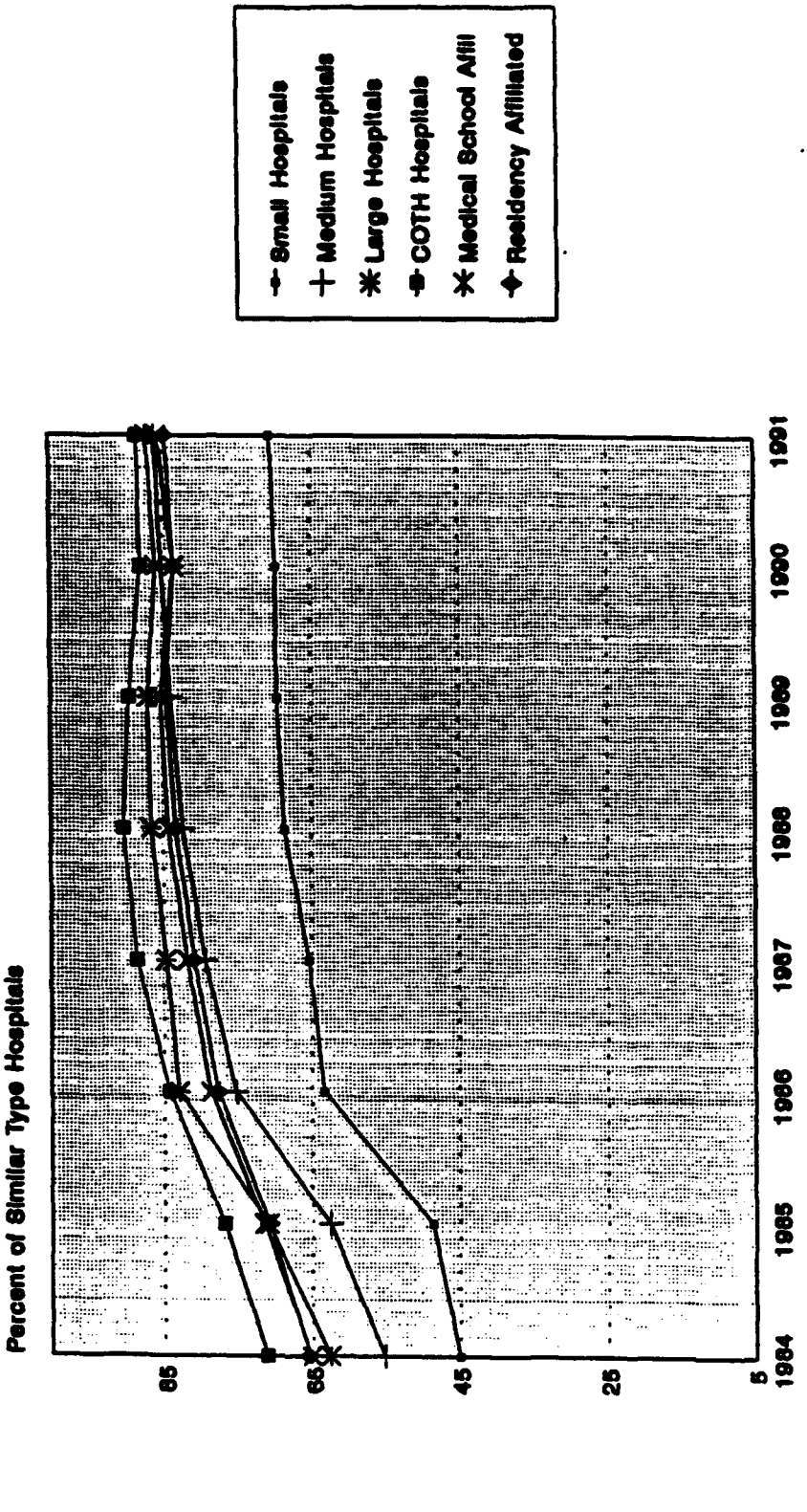


The AHA survey did not ask about membership in alliances until 1988

(P1)

Figure 8

Prevalence of Hospital Affiliations with DCAs (AFIL)
By Size and Medical Education Status



COTH-member hospitals. The lower frequencies of affiliations by smaller, public and investor-owned hospitals are partially due to their lower relative proportion among all hospitals. But when evaluated as a proportion of their own type (e.g., percentage of affiliating IO hospitals relative to all IO hospitals), their rates of affiliation were lower than those for other types, such as NFPs and members of alliances.

Relative to all affiliating hospitals, many hospital types have increased affiliations to the same degree as has the general community hospital population, and therefore have retained a stable proportion of all those affiliated over the study period (as shown in Appendix I, Table I-2). For example, the relative proportion of hospitals by ownership status did not appreciably change over the eight years: with not-for-profits the majority all affiliated hospitals (averaging between 70-76% each year), followed by investor-owned (averaging between 13-16%) and public hospitals (11-13%). Others retaining stable representation included contract-managed (6-8% of all affiliated hospitals each year) and small hospitals (between 16-17%). Interestingly, several types of hospitals increased their representation, or relative proportion, among all community hospitals and among all affiliated hospitals as well (e.g., those belonging to multihospital systems and alliances, and medium sized hospitals having 100 to 299 beds). Other types of hospitals decreased in frequency relative to the community population and to the affiliated sample, such as large hospitals and those identified with ties to medical schools and residency programs.

In general, affiliating hospitals seldom changed their emphasis of one form of DCA over the other. Not-for-profit and large hospitals, and members of the COTH

have affiliated slightly more frequently with HMOs than with PPOs. Others have instead consistently affiliated with PPOs more frequently than with HMOs, such as investor-owned, public and small institutions, and those involved with multi-hospital systems or alliances. For profit hospitals have also maintained affiliations with BOTH more often than with HMOs. The only inconsistency in the noted trends were contract-managed hospitals, which, beginning in 1988, switched from slight dominance in a greater frequency of HMO-affiliations to slightly greater frequency of PPO affiliations. In most cases, however, the range in difference has usually been quite small, on the order of 2-5 percentage points of all affiliated.

For the most part, the trends depicted in the graphs and supporting tables also indicate some hospital types have been slightly over-represented in affiliations with all three DCA categories (HMO, PPO and BOTH): medium size hospitals, members of systems, alliances or the COTH, and affiliated with residency programs. Hospitals linked to medical schools have usually been over-represented in their affiliations with HMOs or BOTH.

Non-Parametric Analysis of Prevalence

The trend analysis responded to the first research question by illuminating the nature and scope of hospital-DCA affiliations in terms of the frequency of affiliations differentiated by commonly cited organizational attributes such as ownership, size and associations with other hospital groups. Responding to the second and third research questions, the relationships between hospital affiliation strategies and key hospital and

market factors were examined using non-parametric analysis. The non-parametric analyses provided a preliminary assessment of the resource dependence hypotheses used to predict many of these relationships.

Hospitals were first classified in one of two groups, whether or not they affiliated with a DCA. Without controlling for the effects of other independent variables, differences in hospital and market characteristics were examined using the Wilcoxon 2-sample non-parametric test of means under the null hypothesis that the means of the affiliated and non-affiliated groups were equal. The absence of a significant difference in the means of a variable indicated the hospital observations were drawn from the same populations, and that the variable was not useful in differentiating hospital affiliation strategies. Within the group of hospitals affiliating with any DCA, hospitals were then examined for significant differences based on whether they affiliated with HMOs, with PPOs, or with both network types. Dependent and independent variables were measured in the same year.

The extent to which influential variables changed over time was addressed by examining the data over three points in time, as previously addressed in the methodology chapter: 1985, 1988 and 1991. The analysis of the prevalence in affiliations during the 1984-1991 time frame also showed that selecting 1985 as the first time frame coincided with a marked acceleration in the prevalence of affiliations between 1984 and 1986. Beginning the analysis with this year was expected to minimize any confounding affects on cost and related measurements associated with hospitals adjusting to Medicare's prospective reimbursement methodology

implemented in 1983 and phased-in over three years. Analysis of the prevalence trends provided additional support for basing the second time frame on 1988 because the prevalence rates were observed to level off by the end of that year. Using 1991 for the final time frame was appropriate because it offered the most recently available data and provided the latest end point in eight years of longitudinal data.

The second research question was concerned with the market and organizational factors (other than efficiency) related to hospital choice in affiliating or not with DCAs, and, among those affiliated, whether affiliation was with HMOs, with PPOs, or with both. The results of the multiple non-parametric analyses of the organizational and market factors associated with the prevalence of hospital affiliations with DCAs are summarized in Table 4. The table presents the means and standard deviations of the organizational and market variables for DCA-affiliated and non-affiliated hospitals in 1985 (n = 2,655), 1988 (n = 2,660) and 1991 (n = 2,625). The table also presents the Wilcoxon 2-sample z, and associated p-values to show the extent to which the means of each group differ. For example, the proportion of affiliated public community hospitals in 1985 (.12, n=1,666) relative to all community hospitals (n = 2,655) was significantly lower (at $p \leq 0.01$) than the average of unaffiliated public community hospitals (n = 989). Public hospitals were therefore less frequently involved in DCA affiliations than non-public hospitals (i.e. private investor-owned and not-for-profit) in 1985, and also in 1988 and 1991.

Table 4. Non-Parametric Analysis of Prevailing Hospital Affiliations with DCAs

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=1,666	Non-Affiliated Hospitals Mean (SD) N=989	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=2,161	Non-Affiliated Hospitals Mean (SD) N=499	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=2,191	Non-Affiliated Hospitals Mean (SD) N=434	Wilcoxon 2-Sample Z-Value
HOSPITAL FACTORS									
PUBLIC	0.12 (0.33)	0.18 (0.38)	3.81***	0.13 (0.33)	0.18 (.39)	3.16***	0.12 (0.33)	0.18 (0.33)	3.63 ***
PVTIO	0.14 (0.35)	0.18 (.38)	2.63***	0.16 (0.37)	0.21 (0.41)	2.91***	0.15 (0.35)	0.21 (0.41)	3.18 ***
PVTNFP	0.73 (0.44)	0.64 (0.48	-5.00***	0.71 (0.45)	0.61 (0.49)	-4.72 ***	0.73 (0.44)	0.61 (0.49)	-5.26***
SYSTEM	0.41 (0.49)	0.28 (0.45)	-6.86***	0.47 (0.50)	0.39 (0.49)	-3.43***	0.49 (0.50)	0.35 (0.48)	-5.37***
DAYS	82,594 (69,197)	66,086 (66,018)	-8.33***	83,098 (71,882)	64,202 (67,705)	-7.71 ***	86,243 (72,324)	71,930 (72,457)	-6.04***
SERVMIX	0.62 (0.20)	0.51 (0.22)	-11.96***	0.65 (0.19)	0.54 (0.21)	-11.23***	0.67 (0.18)	0.57 (0.21)	-9.34***
RESIDENT	22.53 (65.57)	15.85 (59.88)	-5.13***	22.80 (68.50)	18.10 (70.90)	-2.61***	24.34 (77.41)	22.07 (77.42)	-0.93 ns
SEVERITY	0.08 (0.08)	0.05 (0.07)	-8.74***	0.094 (0.083)	0.068 (0.097)	-8.93***	0.109 (0.092)	0.077 (0.114)	9.19***
NRTHEAST	0.18 (0.39)	0.25 (0.44)	4.39 ***	0.20 (0.40)	0.29 (0.46)	4.68***	0.21 (0.40)	0.31 (0.46)	4.73***
NRTHCENT	0.29 (0.45)	0.19 (0.38)	-5.81***	0.26 (0.44)	0.13 (0.33)	-6.50***	0.26 (0.44)	0.12 (0.32)	-6.51***
WEST	0.25 (0.43)	0.11 (0.32)	8.61***	0.22 (0.41)	0.10 (0.30)	-5.97***	0.21 (0.40)	0.12 (0.32)	-4.24***
MARKET FACTORS									
HCOMP	30.92 (29.30)	22.46 (25.31)	-10.27***	27.40 (27 00)	22.70 (26.80)	-6.07***	25.35 (24.62)	20.55 (25.05)	-6.37***
MKTSHR	0.10 (0.14)	0.14 (0.20)	2.01**	0.11 (0.17)	0.13 (0.20)	-1.15 ns	0.12 (.018)	0.14 (0.22)	-.52 ns
HHI	0.13 (0.14)	0.21 (0.19)	10.34***	0.16 (0.17)	0.22 (0.20)	6.07***	0.17 (0.17)	0.24 (0.22)	6.23***
RAFIL	0.75 (0.19)	0.42 (0.29)	-28.63***	0.88 (0.14)	0.54 (0.31)	-25.34***	0.88 (0.13)	0.58 0.30)	-23.11***
ROCUP* MKTSHR	0.13 (0.25)	0.16 (0.31)	-1.84 *	0.14 (0.27)	0.16 (0.31)	-4.72 ***	0.16 (0.29)	0.17 (0.33)	-4.49***

Source: American Hospital Association Annual Survey of Hospitals computerized data base

Notes:

1. Data reflect prevalence only; hospitals affiliating in a year may or may not have been previously affiliated.
2. * Significant at $p \leq 0.1$; ** Significant at $p \leq 0.05$; *** Significant at $p \leq 0.01$

The results from Table 4 indicate that, across all three time frames, hospitals affiliating with any form of DCA have been larger (in DAYS and SERVMIX) with a higher proportion being members of multi-hospital systems and a lower proportion public or investor-owned than those not affiliating at all (significant at $p \leq 0.01$, with $2,625 \leq n \leq 2,660$). A larger proportion of affiliated hospitals were located in the north-central or western regions of the U.S. and treated patients with generally higher levels of SEVERITY ($p \leq 0.01$). A greater proportion of affiliated hospitals operated in more competitive markets ($p \leq 0.01$), generally with more hospitals (HCOMP), with lower concentration of patient discharges (HHI), and with more hospitals affiliated with DCAs (RAFIL). Affiliated hospitals were not very different from non-affiliated hospitals in terms of market share, except in 1985. The interaction term, ROCUP*MKTSHR indicates a greater proportion of affiliated hospitals had lower resource need and equivalent autonomy compared to those without affiliations.

In comparing the factors associated with hospital selection strategies for particular types of DCAs among affiliated hospitals ($1,666 \leq n \leq 2,191$), the characteristics distinguishing HMO-affiliating and non-HMO affiliating hospitals (Table 5) were different along a number of factors from those distinguishing PPO-affiliating and non-PPO affiliating hospitals (Table 6). As Table 5 indicates, fewer hospitals affiliated with HMOs were public or proprietary institutions, and usually larger in terms of patient volume (DAYS), scope of services (SERVMIX), and involvement with medical education (RESIDENT) compared to hospitals that were not

Table 5. Non-Parametric Analysis of Prevailing Hospital Affiliations with HMOs

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=1,428	Non-Affiliated Hospitals Mean (SD) N=238	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,929	Non-Affiliated Hospitals Mean (SD) N=232	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,956	Non-Affiliated Hospitals Mean (SD) N=235	Wilcoxon 2-Sample Z-Value
				HOSPITAL FACTORS					
PUBLIC	0.12 (0.33)	0.15 (0.36)	1.15 ns	0.12 (0.32)	0.21 (0.40)	4.00 ***	0.11 (0.31)	0.20 (0.40)	3.99***
PVTIO	0.13 (0.34)	0.18 (0.39)	2.1**	0.15 (0.36)	0.22 (0.42)	2.91***	0.14 (0.35)	0.17 (0.38)	1.28 ns
PVTNFP	0.75 (0.44)	0.67 (0.47)	-2.5**	0.73 (0.44)	0.57 (0.50)	-5.31***	0.75 (0.44)	0.63 (0.48)	-3.96***
SYSTEM	0.41 (0.49)	0.42 (0.49)	0.18 ns	0.48 (0.50)	0.42 (0.50)	-1.59 ns	0.50 (0.50)	0.43 (0.50)	-2.06**
DAYS	85,610 (71,000)	64,498 (53,875)	-4.72***	86,065 (73,135)	58,434 (54,670)	-6.67***	88,466 (73,079)	67,743 (62,856)	-5.34***
SERVMIX	0.62 (0.20)	0.57 (0.20)	-3.94***	0.66 (0.19)	0.57 (0.20)	-6.29***	0.68 (0.18)	0.62 (0.20)	-4.40***
RESIDENT	24.12 (66.64)	13.01 (58.00)	-5.25***	24.41 (70.21)	9.54 (50.78)	-5.57***	25.86 (79.26)	11.76 (58.45)	-4.60***
SEVERITY	0.080 (0.080)	0.065 (0.065)	-2.99***	0.097 (0.085)	0.077 (0.065)	-2.91***	0.111 (0.093)	0.092 (0.082)	-3.25***
NRTHEAST	0.20 (0.40)	0.07 (0.26)	-4.81***	0.21 (0.40)	0.12 (0.33)	-3.1***	0.21 (0.41)	0.14 (0.35)	-2.61***
NRTHCENT	0.30 (0.45)	0.22 (0.41)	-2.52**	0.27 (0.45)	0.18 (0.39)	-3.03***	0.27 (0.45)	0.19 (0.39)	-2.64***
WEST	0.24 (0.43)	0.30 (0.46)	1.96*	0.22 (0.41)	0.22 (0.41)	-.095 ns	0.21 (0.41)	0.14 (0.35)	-2.42**
				MARKET FACTORS					
HCOMP	32.21 (29.61)	23.20 (26.12)	-5.32***	28.74 (27.36)	16.68 (21.37)	-8.45***	26.84 (25.05)	12.93 (16.04)	-10.69***
MKTSHR	0.09 (0.13)	0.12 (0.17)	2.30**	0.11 (0.16)	0.18 (0.23)	3.24***	0.11 (0.16)	0.20 (0.24)	5.24***
HHI	0.12 (0.14)	0.18 (0.17)	6.04***	0.15 (0.16)	0.25 (0.21)	8.90***	0.15 (0.16)	0.29 (0.21)	11.21***
RAFIL	0.77 (0.18)	0.67 (0.21)	-7.18***	0.88 (0.13)	0.81 (0.20)	-4.09***	0.89 (0.12)	0.81 (0.19)	-5.04***
ROCUP* MKTSHR	0.12 (0.24)	0.14 (0.280)	-1.47 ns	0.13 (0.25)	0.23 (0.37)	0.59 ns	0.15 (0.28)	0.25 (0.36)	2.47**

Source: American Hospital Association Annual Survey of Hospitals computerized data base

Notes:

1. Data reflect prevalence only; hospitals affiliating in a year may or may not have been previously affiliated.
2. * Significant at $p \leq 0.1$; ** Significant at $p \leq 0.05$; *** Significant at $p \leq 0.01$

Table 6. Non-Parametric Analysis of Prevailing Hospital Affiliations with PPOs

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=1,106	Non-Affiliated Hospitals Mean (SD) N=560	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,789	Non-Affiliated Hospitals Mean (SD) N=372	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,945	Non-Affiliated Hospitals Mean (SD) N=246	Wilcoxon 2-Sample Z-Value
				HOSPITAL FACTORS					
PUBLIC	0.13 (0.33)	0.12 (0.32)	0.41 ns	0.13 (0.33)	0.14 (0.35)	0.74 ns	0.12 (0.33)	0.09 (0.29)	-1.4 ns
PVTIO	0.16 (0.37)	0.11 (0.31)	-3.0***	0.17 (0.38)	0.10 (0.30)	-3.26***	0.16 (0.36)	0.06 (0.24)	-4.03***
PVTNFP	0.71 (0.45)	0.78 (0.42)	2.6***	0.70 (0.46)	0.76 (0.43)	2.09**	0.72 (0.45)	0.85 (0.36)	3.93***
SYSTEM	0.44 (0.50)	0.36 (0.48)	-3.19***	0.49 (0.50)	0.37 (0.48)	-4.50***	0.51 (0.50)	0.37 (0.48)	-4.25***
DAYS	80,740 (64,872)	86,255 (76,959)	.65 ns	81,387 (69,096)	91,330 (83,618)	1.58 ns	84,411 (69,354)	100,730 (91,394)	2.45**
SERVMIX	0.62 (0.20)	0.62 (0.20)	-.24 ns	0.65 (0.19)	0.65 (0.20)	.06 ns	0.67 (0.18)	0.66 (0.19)	-.66 ns
RESIDENT	18.97 (57.78)	29.56 (78.31)	3.87***	20.25 (64.12)	35.16 (85.71)	4.93***	22.69 (75.33)	37.42 (91.32)	4.53***
SEVERITY	0.081 (0.080)	0.073 (0.073)	-1.50 ns	0.097 (0.083)	0.084 (0.083)	-3.54***	0.111 (0.092)	0.089 (0.092)	-4.22***
NRTHEAST	0.07 (0.26)	0.40 (0.49)	16.29***	0.13 (0.34)	0.51 (0.50)	16.56***	0.15 (0.36)	0.62 (0.49)	16.99***
NRTHCENT	0.30 (0.46)	0.26 (0.44)	-1.57 ns	0.28 (0.45)	0.18 (0.39)	-3.90***	0.28 (0.45)	0.13 (0.34)	-4.88***
WEST	0.32 (0.47)	0.11 (0.31)	-9.66***	0.24 (0.43)	0.10 (0.30)	-5.90***	0.21 (0.41)	0.13 (0.34)	-3.09***
				MARKET FACTORS					
HCOMP	32.00 (30.21)	28.78 (27.30)	-2.91***	27.70 (26.93)	26.19 (27.52)	-2.16**	24.98 (23.92)	28.26 (29.48)	-.10 ns
MKTSHR	0.09 (0.13)	0.11 (0.15)	1.30 ns	0.11 (0.17)	0.12 (0.17)	.76 ns	0.12 (0.17)	0.12 (0.19)	-.52 ns
HHI	0.12 (0.13)	0.15 (0.16)	1.76*	0.15 (0.16)	0.17 (0.18)	1.12 ns	0.17 (0.17)	0.17 (0.19)	-.83 ns
RAFIL	0.76 (0.17)	0.74 (0.21)	-1.14 ns	0.89 (0.13)	0.82 (0.19)	-5.21***	0.89 (0.12)	0.81 (0.18)	-6.51***
ROCUP* MKTSHR	0.12 (0.22)	0.14 (0.29)	.92 ns	0.15 (0.27)	0.14 (0.23)	.84 ns	0.16 (0.29)	0.15 (0.27)	.32 ns

Source: American Hospital Association Annual Survey of Hospitals computerized data base

Notes:

1. Data reflect prevalence only; hospitals affiliating in a year may or may not have previously affiliated.
2. * Significant at $p \leq 0.1$; ** Significant at $p \leq 0.05$; *** Significant at $p \leq 0.01$

affiliated with HMOs. HMO-affiliated hospitals were also more frequently situated in the northeast and north-central areas of the country. Table 6 indicates that those hospitals affiliating with PPOs were, relative to hospitals not affiliated with PPOs, more frequently investor-owned, members of hospital systems, generally less involved with medical education, with a lower proportion located in the northeast and higher proportions located in the north-central and western parts of the country. Scope and volume were not distinguishing characteristics of hospitals affiliating with PPOs. Hospitals affiliating with both HMOs and PPOs (Table 7) were not consistently different from those institutions not affiliating with both, across all three years, in terms of ownership or medical education. Similar to those affiliating with HMOs, institutions affiliating with BOTH were more frequently larger (DAYS and SERVMIX), treating patients with a higher level of SEVERITY, and more often located in the NORTHCENT and WEST regions, and less often in the NRTHEAST.

With respect to market conditions, although HMO and PPO affiliating hospitals were located in markets with more hospitals (HCOMP) and higher rates of hospital affiliations (RAFIL), the markets for HMO affiliates (Table 5)were more competitive in that few hospitals monopolized the market (HHI) and individual hospital market shares (MKTSHR) tended to be lower. Hospitals affiliated with PPOs (Table 6) appear to have operated in markets that were no different from those markets with hospitals that have not affiliated with PPOs, while hospitals affiliating with BOTH (Table 7) reflected the same characteristics as those HMO-affiliated hospitals (Table 5). That is, hospitals affiliating with both HMOs and PPOs (Table 7) were more

Table 7. Non-Parametric Analysis of Prevailing Hospital Affiliations with BOTH

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=868	Non-Affiliated Hospitals Mean (SD) N=798	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,557	Non-Affiliated Hospitals Mean (SD) N=604	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=1,710	Non-Affiliated Hospitals Mean (SD) N=481	Wilcoxon 2-Sample Z-Value
				HOSPITAL FACTORS					
PUBLIC	0.12 (0.33)	0.13 (0.33)	.42 ns	0.11 (0.32)	0.17 (0.37)	3.38***	0.11 (0.32)	0.15 (0.35)	1.95*
PVTIO	0.15 (0.36)	0.13 (0.34)	-1.41 ns	0.16 (0.37)	0.15 (0.36)	-.73 ns	0.15 (0.36)	0.12 (0.32)	-2.11**
PVTNFP	0.73 (0.44)	0.74 (0.44)	.80 ns	0.73 (0.45)	0.68 (0.47)	-1.90*	0.73 (0.44)	0.74 (0.44)	.26 ns
SYSTEM	0.45 (0.50)	0.38 (0.49)	-2.88***	0.50 (0.50)	0.39 (0.49)	-4.88***	0.52 (0.50)	0.40 (0.49)	-4.78***
DAYS	85,194 (66,918)	79,766 (71,529)	-2.69***	84,807 (70,372)	78,694 (75,520)	-3.28***	86,701 (69,907)	84,614 (80,386)	-2.12**
SERVMIX	0.63 (0.20)	0.60 (0.20)	-2.99***	0.66 (0.18)	0.62 (0.20)	-4.29***	0.68] (0.18)	0.64 (0.19)	-3.79***
RESIDENT	20.6 (57.7)	24.6 (73.2)	-.024 ns	21.8 (65.7)	23.3 (75.3)	.31 ns	24.2 (77.3)	24.9 (78.0)	.02 ns
SEVERITY	0.085 (0.084)	0.071 (0.071)	-3.51***	0.10 (0.08)	0.081 (0.077)	-4.96***	0.114 (0.093)	0.091 (0.087)	-5.65***
NRTHEAST	0.07 (0.26)	0.30 (0.46)	12.03***	0.13 (0.34)	0.36 (0.48)	11.80***	0.15 (0.36)	0.38 (0.49)	11.01***
NRTHCENT	0.32 (0.47)	0.25 (0.43)	-3.25***	0.30 (0.46)	0.18 (0.39)	-5.36***	0.29 (0.45)	0.16 (0.37)	-5.70***
WEST	0.33 (0.47)	0.17 (0.37)	-7.76***	0.25 (0.46)	0.15 (0.35)	-5.07***	0.22 (0.42)	0.14 (0.34)	-4.16***
				MARKET FACTORS					
HCOMP	34.41 (30.82)	27.12 (27.06)	-6.47***	29.35 (27.29)	22.54 (25.73.)	-7.65***	26.64 (24.34)	20.77 (25.06)	8.07***
MKTSHR	0.08 (0.11)	0.11 (0.16)	2.60***	0.10 (0.15)	0.14 (0.20)	2.88***	0.11 (0.16)	0.16 (0.22)	3.52***
HHI	0.11 (0.11)	0.16 (0.16)	5.89***	0.14 (0.15)	0.20 (0.19)	7.08***	0.15 (0.16)	0.23 (0.21)	7.75***
RAFIL	0.79 (0.15)	0.72 (0.21)	-6.10***	0.90 (0.11)	0.82 (0.19)	-7.20***	0.90 (0.10)	0.81 (0.18)	-8.74***
ROCUP* MKTSHR	0.11 (0.21)	0.14 (0.29)	-.16 ns	0.13 (0.26)	0.17 (0.29)	1.12 ns	0.15 (0.28)	0.20 (0.32)	1.62 ns

Source: American Hospital Association Annual Survey of Hospitals computerized data base

Notes:

1. Data reflect prevalence only; hospitals affiliating in a year may or may not have been previously affiliated.
2. * Significant at $p \leq 0.1$; ** Significant at $p \leq 0.05$; *** Significant at $p \leq 0.01$

frequently located in competitive markets compared to those not affiliating with both (higher HCOMP and RAFIL, and lower MKTSHR and HHI), similar to the markets for hospitals affiliating with HMOs (Table 5).

With respect to hospital efficiency (the third research question), affiliating hospitals were more often efficient than unaffiliated hospitals, as measured by all five efficiency variables (Table 8). Affiliated hospitals, compared to unaffiliated hospitals, generally had **better productivity** in more frequently showing lower use of labor resources per adjusted occupied bed (FTEBED), and **better process efficiency** reflected in higher occupancies (ROCUP) and lower average lengths of stay (RALOS) compared to the average in their MSA markets. DCA-affiliated hospitals also had **better cost efficiency** with lower costs per adjusted patient day (COSTEF) and were **technically more efficient** (TECHEF). Hospitals affiliating with HMOs showed **better productivity** (FTEBED) and **process efficiency** (ROCUP and RALOS) than those not affiliated with HMOs. Hospitals affiliating with PPOs were distinguished from those not affiliating with PPOs only by their **better process efficiency** in terms of lower RALOS. Hospitals affiliating with both HMOs and PPOs showed higher frequencies of those with better productivity and productivity (except ROCUP in 1991), similar to those affiliating with HMOs.

Comparisons of efficiency provide three interesting points. First, it is only at the aggregate level in which hospitals affiliating with any DCA form had consistently better indicators of process, productivity, cost and technical efficiency than those not affiliating. Differences in cost and technical efficiency were not evident when

Table 8. Non-Parametric Analysis of Efficiency in Prevailing Hospital Affiliations

	1985			1988			1991		
Efficiency Factors	Affiliated Hospitals Mean (SD)	Non-Affiliated Mean (SD)	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD)	Non-Affiliated Mean (SD)	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD)	Non-Affiliated Mean (SD)	Wilcoxon 2-Sample Z-Value
					AFIL				
FTEBED	2,502.1 (4,951.8)	3,282.0 (5,990.8)	6.34***	1,890.0 (5,096.0)	4,305.0 (9,548.7)	7.91***	1,729.0 (4,485.7)	3,619.6 (5,802.2)	8.21***
ROCUP	1.09 (1.06)	0.84 (0.39)	-5.2***	1.04 (0.90)	0.82 (0.96)	-6.21***	1.04 (0.87)	0.79 (0.94)	-6.71***
RALOS	0.85 (1.57)	1.26 (1.97)	8.38***	0.83 (1.98)	1.75 (2.79)	9.22***	0.87 (2.22)	1.66 (2.41)	10.44***
COSTEF	280,449 (572,884)	329,697 (554,715)	3.75***	195,775 (508,836)	402,027 (753,370)	6.19***	169,390 (537,795)	315,480 (502,280)	7.09***
TECHEF	0.66 (0.21)	0.64 (0.22)	-3.14***	0.66 (0.21)	0.62 (0.23)	3.04***	0.66 (0.22)	0.60 (0.25)	-4.68***
					HMO				
FTEBED	2,389.1 (4,933.0)	3,179.9 (5,020.8)	3.01***	1,701.7 (4,516.0)	3,456.4 (8,360.3)	2.70***	1,625.3 (4,317.7)	2,592.1 (5,632.2)	2.90***
ROCUP	1.12 (1.06)	0.94 (1.00)	-2.93**	1.06 (0.91)	0.87 (0.76)	-2.79***	1.06 (0.88)	0.92 (0.77)	-2.10**
RALOS	0.80 (1.51)	1.13 (1.88)	2.24**	0.78 (1.92)	1.22 (2.38)	2.58***	0.83 (2.24)	1.16 (2.10)	4.78***
COSTEF	266,546 (566,745)	363,866 (602,953)	2.99***	177,204 (465,859)	349,257 763,621)	1.19 ns	162,311 (539,622)	228,314 (519,720)	1.38 ns
TECHEF	0.66 (0.21)	0.65 (0.22)	-.92 ns	0.66 (0.21)	0.66 (0.20)	.19 ns	0.66 (0.20)	-2.47**	
					PPO				
FTEBED	2,513.8 (4,751.3)	2,478.9 (5,330.1)	.11 ns	1,953.0 (5,261.3)	1,587.5 (4,207.7)	1.41 ns	1,730.3)4,511.1)	1,718.4 (4,288.2)	2.23**
ROCUP	1.11 (1.09)	1.05 (0.97)	-.07 ns	1.05 (0.90)	1.01 (0.87)	-.54 ns	1.04 (0.87)	1.03 (0.87)	.36 ns
RALOS	0.80 (1.49)	0.94 (1.72)	2.62***	0.81 (2.00)	0.91 (1.88)	3.90***	0.85 (2.23)	1.04 (2.15)	3.47***
COSTEF	291,259 (566,778)	259,100 (584,681)	-2.05**	202,851 (516,910)	161,164 (467,178)	-.48 ns	171,994 (555,130)	148,807 (373,632)	.47 ns
TECHEF	0.67 (0.21)	0.66 (0.22)	-.67 ns	0.66 (0.20)	0.64 (0.21)	-2.01**	0.66 (0.22)	0.65 (0.23)	-.77 ns
					BOTH				
FTEBED	2,331.2 (4,661.1)	2,687.9 (5,246.4)	2.00**	1,729.0 (4,587.4)	2,305.3 (6,204.5)	3.05***	1,611.9 (4,323.0)	2,145.2 (5,004.2)	6.86***
ROCUP	1.16 (1.12)	1.02 (0.98)	-2.11**	1.08 (0.92)	0.95 (0.83)	-2.37**	1.06 (0.88)	0.97 (0.82)	-1.30 ns
RALOS	0.71 (1.36)	1.00 (1.77)	4.04***	0.75 (1.93)	1.03 (2.09)	5.0***	0.80 (2.25)	1.10 (2.12)	6.22***
COSTEF	371,350 (555,155)	290,346 (591,756)	.09 ns	181,036 (465,612)	233,411 (605,020)	.42 ns	164,254 (559,521)	187,651 (452,234)	1.39 ns
TECHEF	0.67 (0.20)	0.66 (0.22)	-1.28 ns	0.66 (0.20)	0.65 (0.21)	-1.56 ns	0.66 (0.21)	0.63 (0.23)	-2.42**

Source: AHA Annual Survey of Hospitals computerized data base * Significant at $p \leq 0.1$; ** Significant at $p \leq 0.05$; *** Significant at $p \leq 0.01$

comparing affiliating and non-affiliating hospitals at the level of a particular type of DCA. Second, in addition to finding hospitals affiliating with HMOs were more efficient than those not affiliating with HMOs in three of the five measures of efficiency, this group of hospitals consistently had efficiency values that were at least equal to, and usually better than, those hospitals affiliating with PPOs. Third, hospitals opting to affiliate with HMOs appeared very similar, in terms of efficiency and market conditions, to those affiliating with both HMOs and PPOs.

Without controlling for the effects of the other variables in the models, these findings provide some preliminary support for several of the hypothesized relationships derived from resource dependence presented in Chapter 3. For those hypotheses related to the second research question addressing hospital and market factors, a greater proportion of larger hospitals (in volume and scope of services) were affiliated with DCAs (Hypothesis 1). Among the affiliated group, larger hospitals more frequently affiliated with both HMOs and PPOs (Hypothesis 2). A higher proportion of hospitals in systems and those with teaching programs, except in 1991, were affiliated with DCAs (Hypothesis 3). The hypothesis that hospitals with lower resource need and higher autonomy would avoid affiliations (Hypothesis 4) was supported by the significantly lower means in 1988 and 1991 for the interaction term ROCUP*MKTSHR at the DCA-level of affiliations ($p \leq 0.01$ for 1988 and 1991; $p \leq 0.10$ for 1985).

In looking at the market variables, three of the four variables were consistent with the hypothesis (number eight) that DCA-affiliating hospitals operated in markets

with greater competition in terms of more hospitals (HCOMP), lower concentration (HHI), and higher prevailing rates of affiliation (RAFIL). At the aggregate DCA level, affiliating and non-affiliating hospitals were not different for the MKTSHR variable, although a negative relationship was expected for those affiliating with DCAs (i.e., the higher the average MKTSHR, the lower the likelihood of affiliation). This relationship did hold, however, for hospitals affiliating with HMOs or BOTH, but not for affiliations with PPOs.

Results from the non-parametric analysis do not lend support for three of the four hypotheses drawn from the resource dependence prediction matrix in Chapter 3, nor are they adequate for evaluating hospitals affiliating for the first time. Specifically, the fifth, sixth and seventh hypotheses differentiating hospitals affiliating with HMOs from PPOs and with both are not supported due to the lack of statistical significance of the ROCUP*MKTSHR variable and each of the independent ROCUP and MKTSHR variables in the HMO, PPO and BOTH models. Although there were distinct differences in efficiency between affiliating and non-affiliating hospitals, and, to a lesser extent, between those affiliating with HMOs or not and those affiliating with PPOs or not (third research question), these differences pertained to the prevalence (i.e., accumulated) and not the incidence of new affiliations (Hypotheses 9 and 10). Without controlling for other variables, however, these data do suggest, that, while it is possible hospitals may or may not have differed in efficiency initially, differences have developed over time.

Logit Analysis of Prevalence

Both the univariate tests and the bivariate correlation analysis are limited in that they fail to control for the effects of all other variables. The multivariate logit analysis addresses this limitation by evaluating all variables simultaneously, rather than in isolation, and thus controlling for the effects of other variables. Tuma and Hannan (1984, p. 298) note that logit analysis of cross-sectional data is useful for examining the differences in the effects of variables on being in one of two states. In the present study, the two states are reflected in whether the hospital is affiliated or not. The authors point out that when a variable is found to have "no effect" in the cross-sectional analysis, that does not provide evidence the variable is irrelevant to the process, but that it has equal effect on the two rates, and thus, no net effect on the steady-state distribution.

There are two methods for assessing the significance of the association between an independent variable and the dependent variable. The Wald test provides a Chi-square statistic and associated p-value for assessing the significance of each coefficient's contribution to the model. The odds ratio, or cross-product ratio provides a means for directly assessing the association between an independent variable and the likelihood of the dependent variable, or event, occurring, controlling for all other predictor variables. The odds ratio can be interpreted as the effect of the presence of the variable on the odds of the event of affiliation relative to the effect of the absence of the variable on the affiliation event. Confidence interval estimates

(CIEs) for the coefficients are formed to evaluate whether the odds ratio is statistically significantly different from 1.0, or unity. If the confidence interval bounds the null value (1.0), then the estimated odds ratio is not considered significantly different from 1.0, and the variable is interpreted as having no net effect greater than its absence, or than other variables. In the context of this study, the odds ratio expresses the likelihood of the event of affiliation (e.g, AFIL, or affiliation with either an HMO or a PPO) given the presence of the factor relative to the likelihood it is not present. An odds ratio greater than one (unity) indicates the factor has a positive association with the outcome or event, while an odds ratio of less than one indicates a negative association. The magnitude of the odds ratio, when statistically significant, reflects the strength of the association between the predictor variable and the likelihood of the event occurring.

Cleary and Angel (1984) conclude from their comparative analysis of various models involving dichotomous dependent variables that linear (e.g., ordinary least squares) and logistic models produce comparable information regarding the relative importance of predictor variables when the phenomenon being modeled is not a rare event (i.e., having a probability of an event between .25 and .75). The findings presented earlier showed the frequency of hospital affiliations with any form of DCA have increased from 56% in 1984 to 83% in 1991 while the prevalence of HMO affiliations have increased from almost 85% in 1984 to almost 90% by 1991. These data further substantiated the appropriateness of logistic regression methods in this study. The next four tables (9 through 12) summarize the results of the logit analyses

of the differences in affects of organizational and market variables on hospital-DCA relationships in 1985, 1988 and 1991. The results of each of the four hospital-DCA models presented in Chapter 4, and subsequently revised due to multicollinearity, are shown. For ease of reading, only the results of those variables found significant are presented ($p \leq 0.05$). For these significant variables, the tables display the standardized logit parameter estimates, and odds ratios with upper and lower 95% confidence interval estimates. The tables also show the statistical significance of the entire model as well as the percentage of cases correctly predicted by the model as having or not having the DCA-affiliation strategy.

Overall, the models or their prediction equations were significant at the .0001 level, as shown by the log likelihood chi-square statistics testing the null hypothesis that all explanatory variables in the models are zero. The concordant values shown for each model in each year indicated the models correctly predicted which hospitals affiliated with particular DCAs between 72.8% (PPO, in 1988) and 89.2% (AFIL, in 1988) of the time.

The results of the logit analysis of hospital-DCA affiliations in general, depicted in Table 9, indicate that the likelihood of hospitals affiliating with any DCA has been consistently related to two factors in each of the three time frames. After controlling for all other variables, the greater the hospital's mix of services (SERVMIX) and the level of affiliation activity in its MSA market area (RAFIL), the more likely it was involved in an exchange relationship with a DCA. Of these two factors, RAFIL had the greatest association with AFIL in each time frame, as

Table 9. Logit Prevalence Analysis of Hospital-DCA Affiliations (Only Significant Results Shown, at $p \leq 0.05$)

	1985 (N= 2,655)				1988 (N= 2,660)				1991 (N= 2,625)			
Factors	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE
Organizational												
PUBLIC												
PVTIO												
SYSTEM	0.102	1.47	1.16	1.86								
DAYS	0.174	1.0046	1.002	1.007	0.165	1.005	1.002	1.007				
SERVMIX	0.185	4.81	2.58	8.98	0.243	9.20	4.05	20.9	0.259	11.44	4.87	26.9
RESIDENT					-0.106	.997	.995	.999				
NRTHEAST												
NRTHCENT												
WEST												
Efficiency												
FTEBED									-0.182	.932	.879	.989
ROCUP	0.175	1.37	1.15	1.64								
COSTEF												
TECHEF									0.076	1.86	1.01	3.4
Market												
HCOMP												
MKTSHR												
HHI												
RAFIL	0.901	336.5	196.2	577.2	0.890	999.0	582.2	2647	0.864	999.0	869.6	5318
ROCUP* MKTSHR												
Log likelihood	578.0	with 18 df	$p \leq$ .0001		474.5	with 18 df	$p \leq$ .0001		409.1	with 18 df	$p \leq$ .0001	
Concordant	86.1%				89.2%				88.2%			

Notes:

(1) Revised model, after deleting SEVERITY and RALOS due to multicollinearity

(2) Interval for DAYS and FTEBED is C=1000

(3) Columns labeled "Std. Param. Est." provide standardized parameter estimates

(4) Samples each year were: 1985 (Yes= 1,666; No=989); 1988 (Yes=2,161; No= 499); 1991 (Yes=2,191; No=434)

indicated by its larger standardized parameter estimate, although SERVMIX increased in relative influence during that period as indicated by its increasing standardized parameter estimate. Because of its ubiquitous presence and strength of net effect, the variable RAFIL was examined using several techniques. First, when regressed on other independent variables, RAFIL was not significantly linearly related to others ($R^2 = 0.35$), thereby suggesting minimal risk due to multicollinearity. Second, the variable was significantly correlated with the dependent measures, ranging from a relatively low correlation with hospital affiliations with both HMOs and PPOs ($r = 0.37$) to a moderately high correlation with hospital affiliations with DCAs ($r = 0.58$). Finally the stability of the logit model was examined by removing RAFIL. In general, the revised models produced results similar to those just discussed, indicating the basic model as defined in this study, with the variable RAFIL, is relatively stable. With respect to prevailing hospitals affiliating with DCAs, for example, the results of the model without RAFIL matched those of the model with RAFIL, only the former showed that, additionally, all three regional variables and cost efficiency were significant. With respect to hospitals affiliating with HMOs, the models were again similar, except the version without RAFIL found two regional variables significant (NRTHEAST and NRTHCENT). The model without RAFIL consistently reflecte lower concordance value, indicating slightly less accuracy in predicting whether a hospital would affiliate or not.

The net affect of the modeled variables, from which this table is derived, can be interpreted by formulating logistic regression equations using the unstandardized

parameter estimates and sample characteristics for affiliated and unaffiliated hospitals (Hosmer & Lemeshow, 1989). As a case in point, a not-for-profit hospital located in the west that is a member of a multihospital system and having 940 FTEs, 23 residents, 280 beds, 68,000 annual visits and a SERVMIX ratio of 0.6 (the 1985 variable means for affiliated hospitals) has a probability of affiliation of 0.858, or nearly 86%. The odds that this example hospital will affiliate is six times greater (6.04) than an investor owned hospital located in the northeast that is not a member of a multihospital system with 690 FTEs, 16 residents, 220 beds, 50,000 annual visits and a SERVMIX ratio of 0.50 (the 1985 variable means for unaffiliated hospitals). The log odds is 1.8. Further, by holding all other factors constant and increasing only the value of the affiliated hospital's SERVMIX factor from 0.60 to 0.70, the probability it will affiliate increases to almost 88% (0.877), and the odds ratio increases to 7.13 and associated log-odds increases to 1.96.

While no single measure of efficiency has been consistently associated with prevailing hospital-DCA relationships over the seven year period covered in Table 9, there may have been a shift in emphasis. Specifically, hospitals affiliating with any DCA in 1985 tended to have a higher likelihood of process efficiency in using available capacity (ROCUP). By 1991, DCA-affiliating hospitals tended, instead, to reflect greater technical efficiency (TECHEF) and productivity, or FTEBED (given the negative association between higher use of FTEs per occupied bed, and affiliations). Although a hospital's size, or more accurately, its volume (DAYS) was positively related to affiliations with any DCA in the 1980s, by 1991 the factor had no

net effect. The shift toward no net effect can be explained by the finding presented earlier that medium bed-size hospitals notably increased their representation among affiliated hospitals, thereby reducing the volume differences between affiliated and unaffiliated hospitals.

Analysis of the association between the study factors and hospital affiliations with HMOs (Table 10), with PPOs (Table 11) and with both (Table 12) reveal SERVMIX and RAFIL were positively related to specific affiliation strategies as well. SERVMIX was clearly associated with PPO and BOTH affiliation strategies across each time frame, but only with HMO affiliations in 1988. Except for those hospitals affiliating with PPOs in 1985, market-level affiliation activity (RAFIL) was consistently the strongest predictor in all models for all years. By the latter half of the 1980s, therefore, DCA-affiliating hospitals, irrespective of the type of DCA involved, were likely to be operating in markets where significant affiliation activity had occurred. And, since 1985, hospitals with greater mix of services were more likely to affiliate with PPOs or with both PPOs and HMOs, but not necessarily just with HMOs.

While the net effect of a hospital's volume (DAYS) on the likelihood of affiliating at the aggregate level with any DCA ceased having a net effect by 1991, volume remained an important factor related to hospitals affiliating with HMOs (all three time periods), but was not a significant factor in any period for affiliations with PPOs. The greater a hospital's DAYS, the more likely it was affiliated with HMOs in any given year (Table 10), and with BOTH in 1985 and 1988 (Table 12).

Table 10. Logit Prevalence Analysis of Hospital-HMO Affiliations (Only Significant Results Shown, at $p \leq 0.05$)

	1985 (N= 1,666)				1988 (N = 2,161)				1991 (N = 2,191)			
Factors	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE
Organizational												
PUBLIC												
PRIVATE-IO												
SYSTEM												
DAYS	0.226	1.006	1.002	1.01	0.243	1.006	1.002	1.01	0.166	1.004	1.00	1.008
SERVMIX					0.129	3.41	1.33	8.76				
RESIDENT												
NRTHEAST	0.287	3.84	2.14	6.9	0.152	2.00	1.22	3.28	0.217	2.65	1.64	4.27
NRTHCENT									0.157	1.91	1.25	2.91
WEST									0.159	2.04	1.31	3.17
Efficiency												
FTEBED												
ROCUP					0.157	1.37	1.02	1.84				
COSTEF												
TECHEF												
Market												
HCOMP									0.184	1.145	1.019	1.286
MKTSHR												
HHI									-0.173	0.17	0.04	0.73
RAFIL	0.327	24.3	10.6	55.4	0.222	16.48	6.7	40.4	0.251	34.8	12.8	94.6
ROCUP* MKTSHR					-0.178	0.30	0.11	0.80				
Log likelihood	74.9	with 18 df	$p \leq$ .0001		106.7	with 18 df	$p \leq$ .0001		121.3	with 18 df	$p \leq$ .0001	
Concordant	73.1%				76.4%				77.5%			

Notes:
(1) Revised model, after deleting SEVERITY and RALOS due to multicollinearity
(2) Interval for DAYS and FTEBED is C=1000
(3) Columns labeled "Std. Param. Est" provide standardized parameter estimates
(4) Samples each year were: 1985 (Yes= 1,428; No=238); 1988 (Yes=1,929; No= 232); 1991 (Yes=1,956; No=235)

Table 11. Logit Prevalence Analysis of Hospital-PPO Affiliations (Only Significant Results Shown, at $p \leq 0.05$)

	1985 (N= 1,666)				1988 (N = 2,161)				1991 (N = 2,191)			
Factors	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE
Organizational												
PUBLIC												
PRIVATE-IO												
SYSTEM												
DAYS												
SERVMIX	0.05	2.16	1.07	4.39	0.085	2.25	1.01	5.04	0.92	6.64	2.44	18.1
RESIDENT	-.122	.967	.944	.990	-0.110	.971	.951	.993				
NRTHEAST	-0.476	0.11	0.07	0.16	-0.444	0.13	0.09	0.19	-0.555	0.08	0.05	0.13
NRTHCENT									-0.153	0.53	0.31	0.92
WEST	0.094	2.34	1.59	3.44					-0.176	0.45	0.26	0.78
Efficiency												
FTERED												
ROCUP												
COSTEF												
TECHEF												
Market												
HCOMP					0.105	1.073	1.006	1.144				
MKTSHR												
HHI	-0.159	0.132	0.03	0.58								
RAFIL					0.135	5.56	2.57	12.01	0.175	11.79	4.48	31.0
ROCUP* MKTSHR	-0.144	0.35	0.14	0.88								
Log likelihood	174.5	with 18 df	$p \leq$ .0001		144.4	with 18 df	$p \leq$ .0001		145.1	with 18 df	$p \leq$ .0001	
Concordant	75.7%				72.8%				79.2%			

Notes:
(1) Revised model, after deleting SEVERITY and RALOS due to multicollinearity
(2) Interval for RESIDENT AND HCOMP is C=10
(3) Columns labeled "Std. Param. Est" provides standardized parameter estimates
(4) Samples each year were: 1985 (Yes= 1,106; No=560); 1988 (Yes=1,789; No= 372); 1991 (Yes=1,945; No=246)

Table 12. Logit Prevalence Analysis of Hospital Affiliations with Both HMOs and PPOs (Only Significant Results Shown, at $p \leq 0.05$)

	1985 (N= 1,666)				1988 (N = 2,161)				1991 (N = 2,191)			
Factors	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE
Organizational												
PUBLIC					-0.087	0.63	0.45	0.86				
PRIVATE-IO									0.077	1.48	1.01	2.19
SYSTEM												
DAYS	0.177	1.005	1.002	1.007	0.112	1.003	1.0004	1.005				
SERVMIX	0.079	2.04	1.05	3.93	0.133	3.54	1.80	6.97	0.169	5.33	2.49	11.4
RESIDENT	-0.139	.962	.940	.985	-0.113	.971	.951	.990				
NRTHEAST	-.392	0.16	0.11	0.24	-.305	.25	0.18	0.34	-0.231	0.35	0.26	0.49
NRTHCENT												
WEST	0.103	1.54	1.10	2.14								
Efficiency												
FTEBED									-0.199	.923	.855	.996
ROCUP	0.098	1.18	1.02	1.38	0.095	1.21	1.01	1.46				
COSTEF												
TECHEF												
Market												
HCOMP					0.09	1.06	1.006	1.12				
MKTSHR												
HHI	-.219	0.06	0.01	0.29	-0.175	0.15	0.04	0.50	-0.232	0.09	.03	0.32
RAFIL	0.19	6.39	3.22	12.69	0.246	22.91	10.95	47.93	0.294	63.64	27.07	149.6
ROCUP* MKTSHR												
Log likelihood	164.6	with 18 df	$p \leq$ .0001		179.3	with 18 df	$p \leq$ .0001		178.6	with 18 df	$p \leq$ .0001	
Concordant	74.4%				73.9%				76.2%			

NOTE:

(1) Revised model, after deleting SEVERITY and RALOS due to multicollinearity

(2) Interval for DAYS and FTEBED is C=1000; for RESIDENT and HCOMP, C=10

(3) Columns labeled "Std. Param. Est" provide standardized parameter estimates

(4) Samples each year were: 1985 (Yes= 868; No=798); 1988 (Yes=1,557; No=604); 1991 (Yes=1,710; No=481)

HMO-affiliating hospitals were located in the northeast relative to the south. By 1991, all three regions were positively related to affiliations with HMOs. Hospitals affiliating with PPOs or with both were less likely to be located in the northeast, relative to the south. The number of residents in a hospital (RESIDENT) was negatively related to PPO or BOTH affiliating hospitals, at least in 1985 and 1988, but not by 1991. Lastly, hospitals generally were not likely to affiliate with both HMOs and PPOs (BOTH) in MSAs with greater concentration (HHI).

Unlike several of the organizational attributes and market factors, there seems to be no clear pattern between a hospital's efficiency and its likelihood of being affiliated with any particular DCA. The possible shift in emphasis with HMOs, from management of capacity to management of labor and technical efficiency is also found in affiliations with BOTH. Perhaps conspicuous by its absence, however, is that efficiency as measured by any of the four variables is not a significant factor in predicting the likelihood of hospitals affiliating with PPOs.

As might be exp[illegible] in controlling for the confounding effects of other predictor variables, the logit results substantially reduced the number of variables found in the univariate and bivariate analyses to be significantly associated with the prevalence of particular hospital affiliation strategies. The findings lend some support for the first hypothesis that larger hospitals are more likely to affiliate with DCAs (DAYS for 1985 and 1988; SERVMIX for all three periods). The second hypothesis, that larger hospitals would more likely affiliate with HMOs than with PPOs, is not as well supported, since DAYS was a significant factor for HMO-affiliated hospitals in

all three periods, while SERVMIX was a significant factor for PPO-affiliated hospitals in all three periods. The third hypothesis was not supported since membership in a multihospital system had a net effect on affiliations with DCAs only in 1985, while RESIDENT was negatively related to DCA affiliations in 1988. The lack of any net effect of efficiency supports the contention that hospitals affiliating with DCAs initially would not be any more efficient than those not affiliating (Hypothesis 9).

Incidence Analysis

Analysis of the incidence of hospital affiliation strategies with DCAs differs from the first phase in two aspects. All predictor variables in this phase were lagged one year preceding the year of the affiliation event. The event sample was also different because it was restricted in each year group to only the newly affiliating hospitals (i.e., those having no previous affiliations) for comparison to those remaining unaffiliated through that year.

Trends in Incidence of Affiliation

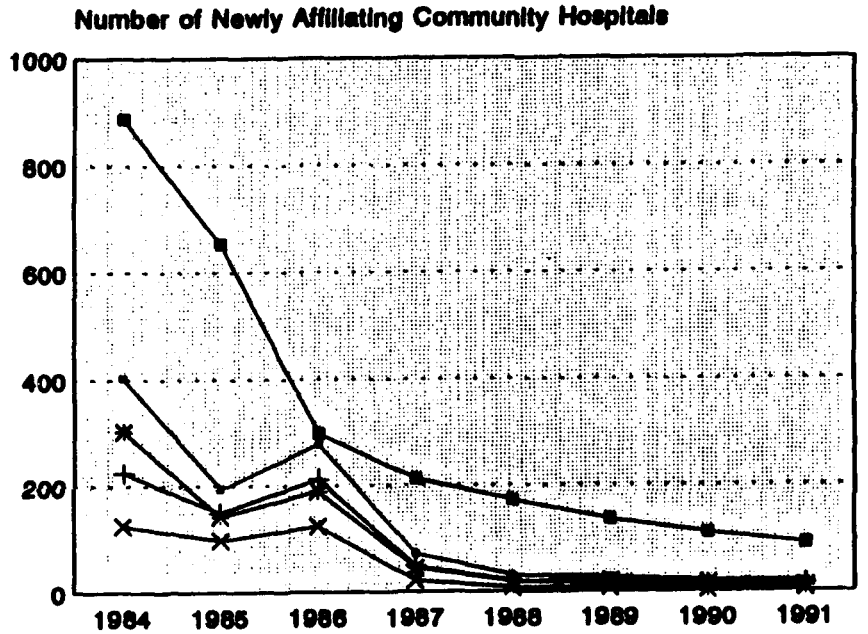
Figure 9, supported by data in Appendix J (Table J-1), shows the number of hospitals affiliating with DCAs for the first time between 1984 and 1991. Beginning with about 400 hospitals affiliating for the first time in 1984, the number of hospitals newly affiliating with either HMOs or PPOs (any DCA) declined precipitously

through 1987. By 1988, only 31 hospitals affiliated with DCAs for the first time. The general decline in new entrants was interrupted in 1986 with a temporary surge in new affiliations. This temporary reversal in the declining number of new affiliations coincided with the nationwide surge in HMO membership and number of plans in 1986 (GHAA, 1993) and the continued double digit growth in PPO membership (AAPPO, 1991). A surge in PPO membership growth occurred in 1987 (AAPPO, 1991). By 1987, therefore, the number of hospitals newly affiliating with PPOs were roughly equal to those affiliating with HMOs. The chart also shows the general decline in the number of new affiliations has been the same whether hospitals affiliated with HMOs, with PPOs or with both. These trends in the incidence of hospitals affiliating for the first time with different DCA types explains the rapid increase in the prevalence of hospital affiliations through 1987, followed by slower increases through 1991, depicted in earlier figures.

The number of community hospitals remaining unaffiliated has declined at a precipitous rate (Figure 9), from about 900 hospitals in 1984 to 89 hospitals by 1991. The remaining 89 hospitals have become unique in continuously reporting no affiliations with any form of DCA since 1984. These few hospitals, representing about 3% of the over 2,600 hospitals sampled in 1991, are truly the "holdouts," or "outcasts," of the 449 unaffiliated hospitals (17%) found in the prevalence analysis.

Figure 9

Incidence Trends: New Hospital-DCA Affiliations (1984-1991)



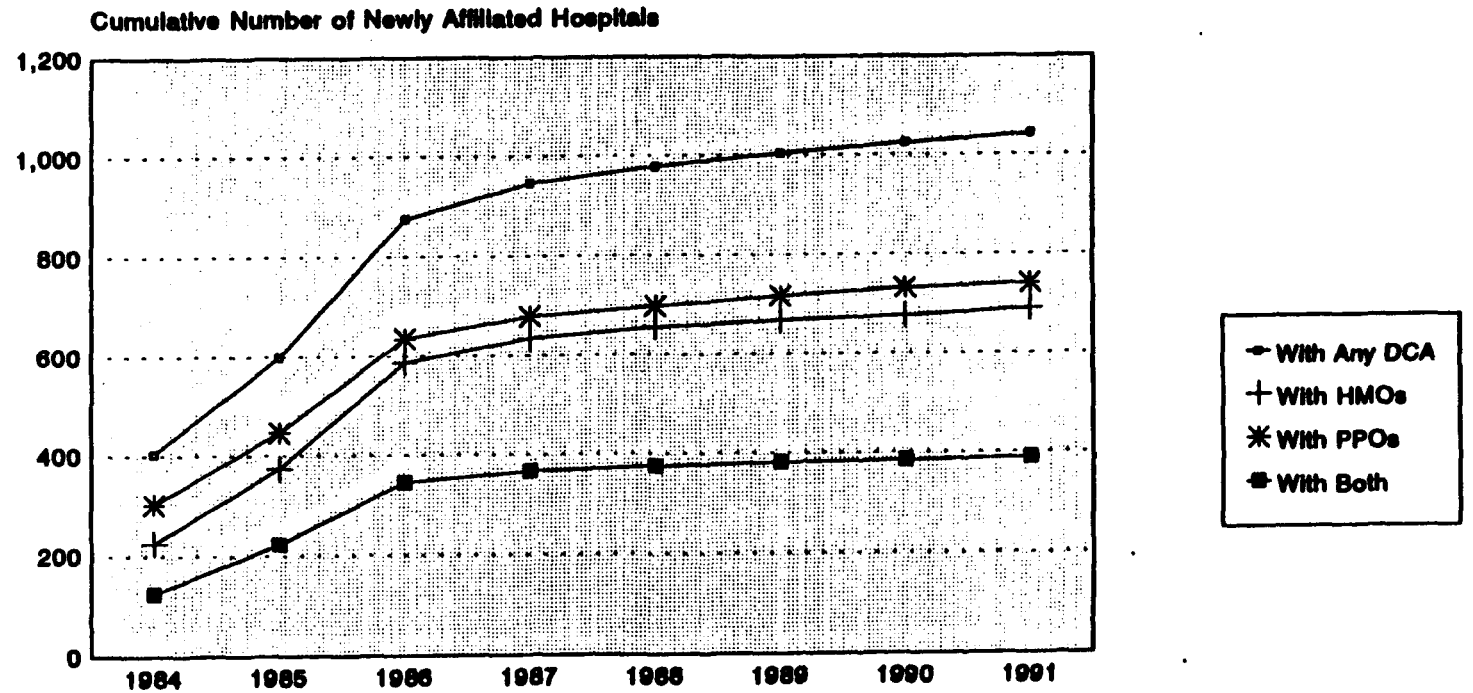
With any DCA	403	194	278	71	31	27	20	18
With HMOs	225	149	212	48	20	14	8	14
With PPOs	303	142	189	44	19	20	15	9
With None since 1983	887	653	298	212	172	135	110	89
With Both	125	97	123	21	8	7	3	5

AHA Reporting Year

Figure 10 portrays the cumulative number of new affiliations between 1984 and 1991. As was expected given the general increase in prevalence of each type of affiliations presented earlier (Figures 5 and 6), this figure shows how new affiliations with PPOs have slightly exceeded those with HMOs. But the incident rate of new hospital affiliations with PPOs has closely paralleled the cumulative rate of new affiliations with HMO. At first glance, this appeared contradictory to the previous findings in which the prevalence rate of hospital contracts with PPOs exceeded those with HMOs, such that by 1991 hospitals were affiliated with either HMOs or PPOs at nearly the same frequency. The parallel cumulative incidence of affiliations therefore raised the question as to how the prevalence of PPO affiliations had increased faster than, and nearly reached parity with, the prevalence of HMO affiliations, when hospitals entered these exchanges at nearly the same rate. The answer appears to be that many previous entrants with HMOs have either switched to or added PPOs, probably beginning in 1988 when the prevalence rate leveled out, even as other hospitals entered by affiliating for the first time with either DCA form. In the absence of more detailed information about the number and type of affiliations at each hospital, this preliminary finding suggests the prevalence of HMO affiliations has remained stable since 1988, while that of PPO affiliations has increased. Some of the "crossover" effect, from HMO to PPO affiliations, may partly be explained by those hospitals affiliating with HMOs that began diversifying their products by offering a PPO option in the late 1980s as well (Gold, 1991). Thus the hospital might then report affiliations with both depending on how the patients are reimbursed.

Figure 10

Cumulative Number of New Hospital-DCA Affiliations



	1984	1985	1986	1987	1988	1989	1990	1991
With Any DCA	403	597	875	946	977	1,004	1,024	1,042
With HMOs	225	374	586	634	654	668	676	690
With PPOs	303	445	634	676	697	717	732	741
With Both	125	222	345	366	374	381	384	389

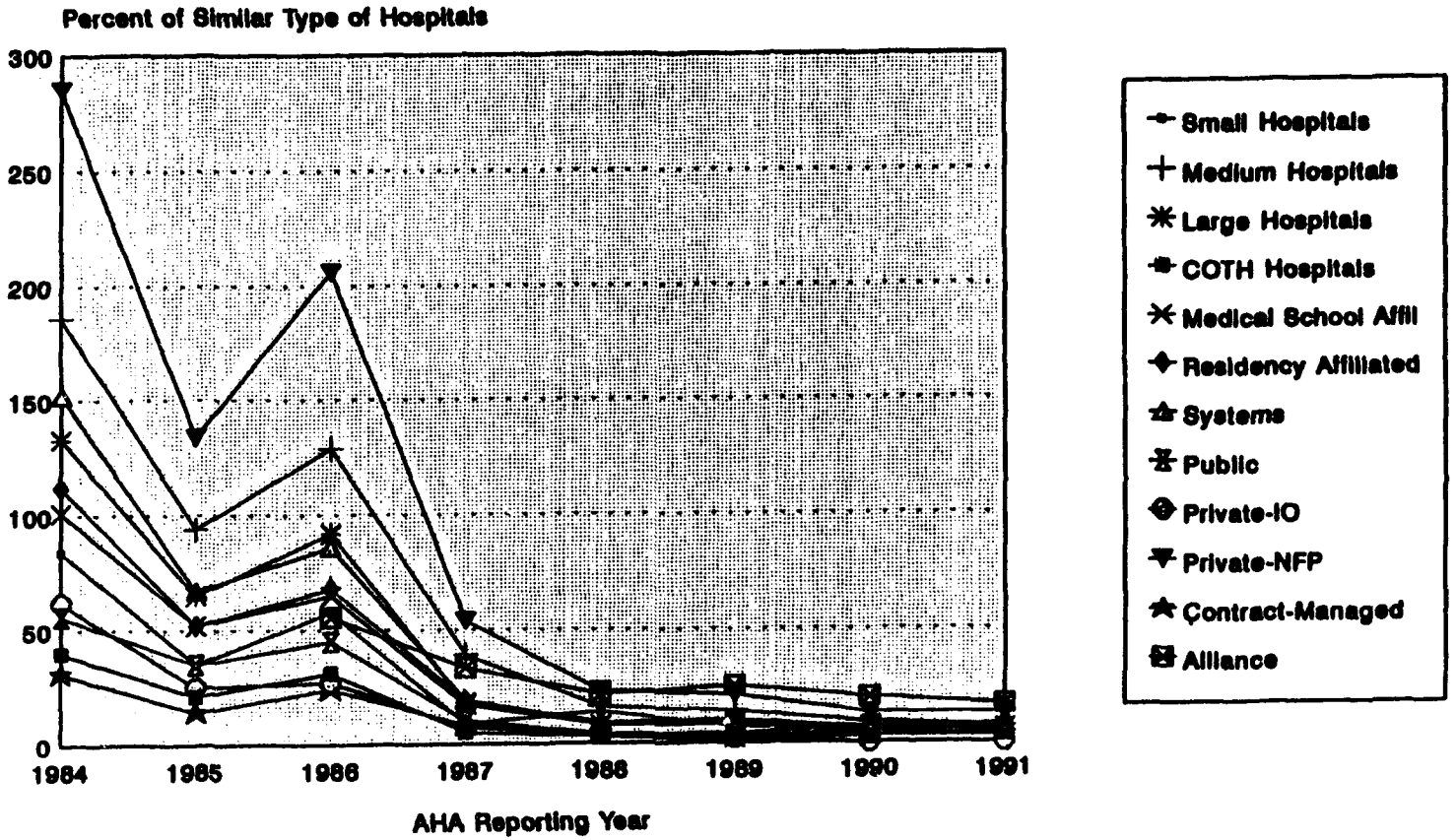
AHA Reporting Year

(110)

The incidence of hospital affiliation with DCAs is similar for all hospital characteristics as shown in Figure 11, irrespective of whether they are classified by bed size, ownership, linkages with other organizations, or involvement with medical education. This homogeneous pattern is also observed when the data are graphed by affiliation with HMOs, PPOs or with both (i.e., rapid decline in new affiliations, brief surge in 1986, and leveling off by 1987). As expected from the prevalence analysis, the various types of hospitals have generally followed an unvarying pattern where the bulk of entrants have been not-for-profit and medium sized (but converging with large hospitals over time). Hospitals consistently under-represented in new affiliations have been smaller, public or investor-owned, members of the COTH, and contract-managed. Investor-owned hospitals have been unique in that, following a steady decline in new affiliations since 1986, by 1990 they were the only category that had ceased new affiliations with any DCAs altogether, although over 20% of prevailing investor-owned hospitals were unaffiliated in 1990 and 1991. Further study of this phenomenon is warranted to determine whether investor-owned hospitals have retreated from the network affiliation strategy, have instead developed wholly-owned DCAs, or have followed some other strategic course.

Figure 11

Incidence of New Hospital-DCA Affiliations
By Hospital Characteristics



(111)

Non-Parametric Analysis of Incidence

The results of the non-parametric univariate analysis of the incidence of new affiliations with DCAs in 1985, 1988 and 1991, from the perspective of affiliating hospitals, are shown in Table 13. In this non-parametric analysis, hospitals that affiliate for the first time in a given year are compared to those hospitals that did not affiliate in that year, nor in previous years. Univariate analysis is based on variables measured in the previous year (e.g., means of hospital and market characteristics measured in 1984 given affiliation status in 1985).

These findings differ from the findings of the non-parametric analysis of the factors associated with the prevalence of affiliations at the aggregate level. Non-parametric analysis of the choice of new affiliations indicates fewer differences between affiliates and non-affiliates at the aggregate level of affiliations with any DCA form, and more differences at the level of specific DCA-affiliation strategies. In general, Table 13 indicates hospitals affiliating with either HMOs or PPOs for the first time in 1985, 1988 or in 1991 have been quite similar to those remaining unaffiliated. More statistically significant differences (at the $p \leq 0.05$ level) were found in 1985, than in 1988 or 1991. Contrary to the expectations that affiliated hospitals would likely belong to multihospital systems (Hypothesis 3), the one exception was that newly affiliating hospitals in 1991, were less frequently members of multihospital systems than unaffiliated hospitals. Supporting the first hypothesis, hospitals affiliating for the first time with DCAs in 1985 offered a larger mix of

Table 13. Non-Parametric Analysis of New Hospital-DCA Affiliations

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=193	Non-Affiliated Hospitals Mean (SD) N=639	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=28	Non-Affiliated Hospitals Mean (SD) N=163	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=17	Non-Affiliated Hospitals Mean (SD) N=84	Wilcoxon 2-Sample Z-Value
				HOSPITAL FACTORS					
PUBLIC	0.18 (0.39)	0.19 (0.39)	.15 ns	0.11 (0.31)	0.20 (0.40)	-1.12 ns	0.29 (0.47)	0.12 (0.33)	1.83*
PVTIO	0.12 (0.32)	0.10 (0.30)	.82 ns	0.14 (0.36)	0.06 (0.24)	1.52 ns	0. (0.0)	0.07 (0.26)	-1.1 ns
PVTNFP	0.70 (0.46)	0.72 (0.45)	.42 ns	0.75 (0.44)	0.74 (0.44)	0.08 ns	0.71 (0.47)	0.81 (0.40)	-.94 ns
SYSTEM	0.40 (0.49)	0.32 (0.47)	1.9*	0.32 (0.48)	0.34 (0.48)	-.23 ns	0.18 (0.39)	0.45 (0.50)	-2.1**
DAYS	83,715 (64,951)	78,087 (70,502)	1.8*	72,534 (53,546)	72,828 (69,674)	.59 ns	99,834 (73,267)	76,704 (69,692)	1.39 ns
SERVMIX	0.56 (0.19)	0.52 (0.22)	2.7***	0.56 (0.23)	0.55 (0.22)	.39 ns	0.69 (0.17)	0.61 (0.21)	12.42 ns
RESIDENT	14.87 (46.40)	17.88 (58.32)	.34 ns	8.46 (22.88)	20.57 (72.05)	-.93 ns	44.06 (130.48)	18.45 (61.80)	.53 ns
SEVERITY	0.07 (0.09)	0.05 (0.07)	2.99***	0.059 (0.044)	0.068 (0.114)	.41 ns	0.081 (0.070)	0.080 (0.155)	1.12 ns
NRTHEAST	0.17 (0.37)	0.34 (0.47)	-4.69***	0.36 (0.49)	0.45 (0.50)	-.89 ns	0.53 (0.51)	0.50 (0.50)	.22 ns
NRTHCENT	0.94 (0.49)	0.23 (0.42)	4.5***	0.14 (0.36)	0.16 (0.37)	-.22 ns	0.18 (0.39)	0.15 (0.36)	.22 ns
WEST	0.10 (0.30)	0.10 (0.30)	.07 ns	0.04 (0.19)	0.10 (0.31)	1.14 ns	0.12 (0.33)	0.10 (0.30)	.27 ns
				HOSPITAL EFFICIENCY					
FTEBED	2,501.9 (7,597.3)	2,267.6 (4,008.0)	2.1**	2,443.4 (4,236.6)	2,509.2 (4,547.0)	.19 ns	1,631.1 (3,557.1)	3,356.5 (5,377.2)	-1.00 ns
ROCUP	1.06 (0.94)	0.89 (0.90)	2.43**	0.78 (0.62)	0.89 (1.04)	-.21 ns	0.89 (0.86)	0.87 (1.15)	.83 ns
RALOS	0.97 (1.76)	1.19 (1.95)	1.83*	0.80 (0.95)	1.75 (3.15)	-.51 ns	0.94 (1.39)	1.90 (3.01)	-1.47 ns
COSTEF	244,630 (577,405)	239,823 (435,946)	-1.71*	250,396 (450,005)	248,122 (437,134)	-.001 ns	160,198 (354,660)	294,229 (481,330)	-.82 ns
TECHEF	0.66 (0.22)	0.63 (0.21)	1.44 ns	0.66 (0.21)	0.61 (0.24)	1.1 ns	0.43 (0.23)	0.41 (0.25)	.26 ns

Source: American Hospital Association Annual Survey of Hospitals computerized data base * Significant at $p \leq 0.1$; ** at $p \leq 0.05$; *** at $p \leq 0.01$

Table 13. (Continued) Non-Parametric Analysis of New Hospital-DCA Affiliations

	1985			1988			1991		
Organizational and Market Factors	Affiliated Hospitals Mean (SD) N=193	Non-Affiliated Hospitals Mean (SD) N=639	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=28	Non-Affiliated Hospitals Mean (SD) N=163	Wilcoxon 2-Sample Z-Value	Affiliated Hospitals Mean (SD) N=17	Non-Affiliated Hospitals Mean (SD) N=84	Wilcoxon 2-Sample Z-Value
				MARKET FACTORS					
HCOMP	22.14 (25.95)	21.01 (24.41)	1.34 ns	19.4 (20.85)	25.16 (29.09)	.45 ns	28.35 (26.69)	26.49 (29.59)	.97 ns
MKTSHR	0.14 (0.18)	0.15 (0.22)	.82 ns	0.18 (0.25)	0.13 (0.19)	1.34 ns	0.12 (0.20)	0.13 (0.18)	.10 ns
HHI	0.18 (0.17)	0.22 (0.21)	-1.49 ns	0.22 (0.23)	0.20 (0.19)	.35 ns	0.14 (0.17)	0.20 (0.19)	-.82 ns
RAFIL	0.42 (0.28)	0.33 (0.29)	4.04***	0.62 (0.23)	0.51 (0.29)	1.72*	0.64 (0.20)	0.53 (0.29)	1.01 ns
ROCUP* MKTSHR	0.17 (0.29)	0.17 (0.31)	1.32 ns	0.18 (0.28)	0.16 (0.28)	.73 ns	0.18 (0.41)	0.14 (0.25)	.27 ns

Source: American Hospital Association Annual Survey of Hospitals computerized data base * Significant at $p \leq 0.1$; ** at $p \leq 0.05$; *** at $p \leq 0.01$

services (SERVMIX) and generally treated patients with greater severity. A greater proportion of hospitals located in the north-central region and a smaller proportion located in the northeast entered into affiliation agreements for the first time.

Without controlling for the statistical effects of other variables, there is mixed evidence of the influence of organizational efficiency and market factors on new affiliations (Hypothesis 9). While affiliating hospitals may have been less productive in using labor resources (higher, or worse FTEBED averages) than those choosing not to affiliate, they also may have been more efficient in managing their delivery process by using available inpatient capacity (higher ROCUP). Support was limited for the contention that DCA-affiliating hospitals operate in more competitive markets than non-affiliated hospitals (Hypothesis 8). The only differences in market variables that affiliating hospitals operated in MSA markets with higher levels of affiliation

that affiliating hospitals operated in MSA markets with higher levels of affiliation activity (RAFIL). But there were no differences between the two hospital groups in other measures of efficiency or market conditions.

Non-parametric analyses of hospitals by their particular affiliation strategy with either HMOs, PPOs or both provide provides some indication that there are certain characteristics associated with particular strategies. Hospitals that affiliated for the first time with HMOs (Table K-1) could be characterized by their market conditions, while those affiliating for the first time with PPOs (Table K-2) could be characterized somewhat by their ownership. Neither type was notably different from non-affiliates in terms of efficiency, thus further limiting support for the hypothesis that hospitals affiliating with HMOs for the first time would be more efficient than those affiliating with PPOs (Hypothesis 10). Hospitals that first affiliated with HMOs in 1985 usually operated in more competitive markets compared to those not affiliated with HMOs, as measured by all four market variables (HCOMP, MKTSHR, HHI, RAFIL, and the interaction term (ROCUP*MKTSHR). By 1991, however, these differences were reduced to only two factors, with HMO affiliates operating in markets with many other community hospitals (higher HCOMP) and with lower concentrations of discharges (Lower HHI) among those hospitals. There is also some indication that while hospitals pursuing affiliations with HMOs in 1985 may have been in more competitive markets (with lower MKTSHR and higher RAFIL), later followers may not necessarily have operated in markets significantly different from those not affiliating with HMOs. With the exception of differences in operating location in

HMOs and PPOs (Table K-3) were not very different from those not affiliating with PPOs or with both in terms of hospital characteristics, efficiency or market factors. More hospitals affiliating with PPOs in 1985 were located in the west, and fewer were in the northeast. PPO-affiliating hospitals by the end of the decade were more likely to be public (1991), and less likely to be profit oriented (1988 and 1991). The relative influence of the organizational and market factors on the likelihood of affiliating for the first time with DCAs can be clarified somewhat better from the findings of the multivariate logit analysis.

Logit Analysis of Incidence

Table 14 summarizes the limited results of the logit analysis of the extent to which organizational and market factors may have influenced the strategy to affiliate with DCAs for the first time in 1985, 1988 and 1991. Table 14 depicts only the significant effects in 1985 and 1988 for the AFIL model (affiliations with either an HMO or PPO), and in 1985 for affiliations with HMOs or with both HMOs and PPOs. An insufficient number of observations or proportions of observations prevented the more comprehensive logit analyses desired in 1991 at the aggregate DCA level (AFIL), in 1985 for affiliations with PPOs, and in 1988 and 1991 for all three models (HMO, PPO or BOTH).

Table 14 corroborates the non-parametric findings by showing that hospitals affiliating early in the decade, relative to those at risk for affiliating with DCAs but

Table 14. Logit Incidence Analysis of Hospital Affiliations with DCAs (1985, 1988) (Only Significant Results Shown, at $p \leq 0.05$)

	Affiliation With Either An HMO or PPO (AFIL)								
	1985 (n=832)				1988 (n=191)				1991 (n=101)
Organizational and Market Factors	Std. Param. Est.	Odds Ratio	LL 95% CIE	UL 95% CIE	Std. Param. Estimate	Odds Ratio	LL 95% CIE	UL 95% CIE	
Organizational									
PUBLIC									
PRIVATE-IO									
SYSTEM									
DAYS									see
SERVMIX	0.159	3.92277	3.92276	3.92280					note
RESIDENT									(2)
NRTHEAST	-.242	0.3845	0.2247	0.6579					below
NRTHCENT									
WEST									
Efficiency									
FTERED									
ROCUP	0.121	1.27	1.0098	1.6043					
COSTEF									
TECHEF									
Market									
HCOMP									
MKTSHR									
HHI									
RAFIL					0.609	47.04	3.73	593.6	
ROCUP* MKTSHR									
Log likelihood	35.4	with 18 df	$p \leq .0001$		13.17	with 18 df	$p \leq .0922$		
Concordant	68.9%				79.3%				

Notes:

(1) Revised model, after deleting SEVERITY and RALOS due to multicollinearity

(2) An insufficient number of observations for successful logit analysis of 1991 AFIL

occupancy levels, and were less likely to be located in the northeast region of the U.S compared to those in the south (at $p \leq 0.05$). While newly affiliating hospitals were different from unaffiliated hospitals in these three characteristics, they were similar in all other organizational characteristics, indicators of efficiency, and in all measures defining the competitive nature of their markets. The differences became less distinct by 1988. when newly affiliated hospitals differed from the remaining, and fewer unaffiliated hospitals, in operating in markets with greater affiliation activity (RAFIL). The limited sample size in 1991 ($n = 101$, with 17 new affiliations) prevented ascertaining whether there were any significant differences by the end of the study period.

Table 15 shows that, among the 193 hospitals affiliating for the first time in 1985, the 148 hospitals pursuing affiliations with HMOs were less likely to be involved with medical education (negative RESIDENT) than those not affiliated with HMOs. Also, while HMO-affiliating hospitals were less efficient in using labor resources (positive FTEBED) than non-HMO-affiliating hospitals, they were more efficient in controlling aggregate costs per adjusted patient day (negative COSTEF). First-time, HMO-affiliating hospitals were also in markets where there was already significant DCA affiliation activity (RAFIL) even as early as 1985. Hospitals affiliating with both HMOs and PPOs were, instead, notable in operating in competitive markets distinguished by lower concentrations of discharges, without any net effect due to the number of hospitals, their relative market share, or the number of

Table 15. Logit Incidence Analysis of Hospital Affiliations in 1985 (Only Significant Results Shown, at $p \leq 0.05$)

	HMO Affiliates 1985				BOTH Affiliates				PPO Affiliates 1985
Organizational and Market Factors	Standardized Parameter Estimate	Odds Ratio	LL 95% CIE	UL 95% CIE	Standardized Parameter Estimate	Odds Ratio	LL 95% CIE	UL 95% CIE	
Organizational									
PUBLIC									
PRIVATE-IO									
SYSTEM									
DAYS									see
SERVMIX									note
RESIDENT	-0.294	0.89	0.799	0.994					(2)
NRTHEAST					-0.434	0.1208	0.1355	0.4107	below
NRTHCENT									
WEST									
Efficiency									
FTEBED	1.736	1.0000001	1.0113	2.267					
ROCUP									
COSTEF	-1.427	1.004	1.0005	1.0076					
TECHEF									
Market									
HCOMP									
MKTSHR									
HHI					-.7659	>.000001	<.000001	.000002	
RAFIL	0.322	8.15	1.087	61.07					
ROCUP* MKTSHR									
Log likelihood	21.5	with 18 df	$p \leq .0001$		28.9	with 18 df	$p \leq .0001$		
Concordant	79.8%				79.8%				

Notes:

(1) Revise model, after deleting SEVERITY and RALOS due to multicollinearity

(2) An insufficient number of observations prevented the successful logit analysis of 1985 affiliations with PPOs, and affiliations with HMOs, with PPOs, or with both in 1988 or 1991.

(3) Intervals for FTEBED and COSTEF are C=1,000; and for RESIDENT C=10

existing affiliations. Similar to hospitals affiliating with any DCA in 1985, those affiliating with both also were less likely to be located in the northeast, relative to the south.

This chapter has presented the results of univariate and multivariate analyses of the prevalence and incidence of hospital affiliations with DCAs. The results form the basis for describing how the scope of hospital affiliations has changed over the past decade, and a preliminary profile of the types of hospitals particularly associated with DCA affiliations with HMOs, PPOs and with both. The analyses have also provided evidence as to the relationships between market and organizational factors, particularly the role of hospital efficiency, with respect to initial and prevailing affiliations.

CHAPTER 6
DISCUSSION AND STUDY LIMITATIONS

Discussion of Major Findings

The present study had two purposes. Its first purpose was to understand how the scope and diversity of hospital affiliations with distribution channel agents, or DCAs, has changed over the past decade. Its second purpose was to evaluate the extent to which selected market and organizational attributes, particularly those related to operational efficiency, influence the decision to affiliate with DCAs. Previous research has seldom explicitly addressed hospital exchange relationships with managed care networks from the perspective of the hospital. The few studies using the hospital as the unit of analysis have relied on anecdotal evidence, or used single time, cross-sectional survey data. Although the current public policy debate emphasizes managed competition as a means of reforming the health care system, especially through organized networks of providers, and the hospital component of the health care industry dominates in so many aspects, managers and public policy makers know little about the nature of hospital relationships with these networks.

This study extends the current theoretical and empirical body of knowledge by using longitudinal data from the 1984-1991 period to examine the scope of hospital

affiliations with two predominant forms of managed care networks, HMOs and PPOs. The study provides a number of findings relevant to understanding the prevalence and incidence of hospital affiliations with DCAs over time. It also empirically tests resource dependence-derived hypotheses to understand the influence of a hospital's salient features, efficiency and market conditions on the likelihood and direction of affiliation with these networks.

Trends in the Scope of Affiliations (Research Question 1)

The cumulative number of hospital affiliations with DCAs grew tremendously over the past decade, from 56% of all U.S. urban community hospitals affiliating with either an HMO or PPO in 1984 to 86% by 1991. But the rate of growth has changed over time. The scope of prevailing affiliations can be characterized as following a shallow, "S-shaped" growth curve similar to an industry life cycle curve. The varying rate of growth in cumulative affiliations shows the rapid diffusion of the DCA affiliating strategy early in the 1980s, especially between 1985 and 1986, followed by a slowing of the growth by 1988. The rapidity and extent of this strategy diffusion was evidenced by several findings. First, the "S-shaped" growth pattern in the number of affiliations was consistently observed whether hospitals were examined at the aggregate level of affiliation with any DCA, or whether they were examined with respect to affiliation with specific DCA types: HMOs, PPOs and both. The same growth pattern was also observed irrespective of whether hospitals were classified by

ownership, profit orientation, bed size, medical education and other typically defining attributes.

The similarity in prevalence growth curves does not imply hospitals have affiliated with the same types of DCAs, nor that they have affiliated with particular network forms at the same rates. For example, while more community hospitals affiliated with HMOs than with PPOs in the early 1980s, the cumulative number affiliating with PPOs and with both increased at a faster rate than those affiliating with HMOs. By 1991 the number of hospitals affiliating with PPOs nearly equaled those affiliating with HMOs, and the number affiliating with both was not far behind. As borne out by analysis of the incidence of new affiliations, hospitals have not necessarily substituted relationships with PPOs for HMOs, but have instead expanded their exchange relationships by affiliating with both.

The similarity in the rapid diffusion of DCA affiliation strategies g an "S shaped" growth curve has several implications. First, with respect to relationships with managed care networks, the great diversity in which hospitals affiliated with particular DCA forms in the early 1980s have converged over time, indicating an increasing tendency toward structural homogeneity, or institutional isomorphism (DiMaggio & Powell, 1983). Institutional theory, which addresses isomorphic tendencies in organizations, focuses on those activities designed to reduce uncertainty by enhancing an organization's legitimacy within its environment. Resource dependence theory focuses on how organizations seek to reduce uncertainty through rational resource exchanges. Both theories converge, however, in focusing on the

issue of how organizations manage access to and security of critical resource flows (Scott, 1987). It could be argued that in the process of trying to secure stability in resource flows, hospitals have faced tremendous pressures to adopt, or at least exhibit, certain structural features indicative of their efforts for managing the care they provide. These pressures may have resulted in the institutionalizing of network affiliations through any one mechanism, or any combination of the three mechanisms, conducive to isomorphic tendencies: coercive, mimetic or imitative, and normative isomorphism (Scott, 1987). The evolving homogeneous patterns found in this study might actually reflect pressures that are mimetic as hospitals imitate affiliation strategies considered successfully pursued by others, normative under the emerging paradigm of cost awareness and responsiveness to growing buyer dominance, or coercive as the locus of control shifts to insurers and purchasers of health care.

From a different perspective, the isomorphic tendencies were also expressed in the consistent pattern with which certain types of hospitals affiliated with certain types of DCAs. Not-for-profit and medium-to-larger size institutions, and members of multi-hospital systems have dominated prevailing DCA affiliations, while small, public and investor-owned institutions have generally been under-represented among those that have chosen to enter these arrangements.

Hospitals also appear to have followed certain affiliation patterns with specific network forms that have changed little over the past decade. Not-for-profit and large hospitals, as well as those involved in medical education (residency programs, COTH and medical school) have tended to affiliate more frequently with HMOs than with

PPOS. Members of multi-hospital systems or alliances have tended to affiliate more often with both DCA forms. Still others have instead tended to affiliate more frequently with PPOs, such as investor-owned, public and small institutions. Because these PPO-oriented institutions have also have been under-represented in prevailing affiliations as a proportion of total affiliations, there may be a relationship between the PPO-affiliation strategy and hesitancy in entering the managed care arena. This conjecture has some support from the literature advocating affiliation with PPOs to buffer other historical fee-for-service arrangements, while advancing, perhaps hesitantly, into managed care (e.g., Cobbs, 1989; Cowan, 1984; Dranove, 1985). Although the differences in the frequency of hospital characteristics associated with particular affiliation strategies specified above appear quite consistent between 1984 and 1991, they have also been quite small. The small differences have converged over time, further supporting the conclusion of isomorphic tendency.

The number of hospitals not affiliating with any form of DCA has rapidly declined over the past decade, such that by 1991 only 17% of the community hospital population reported not having any affiliations. These 449 unaffiliated hospitals in 1991 included those that had previously affiliated but since stopped, as well as a small, core group of 89 hospitals (or 3% of the 2,625 sample hospitals) that had not reported an affiliation at all between 1984 and 1991. Without controlling for the influence of other variables, the non-parametric analyses of the prevalence samples shows these unaffiliated hospitals were more frequently small (in beds and patient volume), with a higher proportion being public or investor owned and offering a

limited range of services. A greater proportion of the unaffiliated hospitals operated in the northeast and less were in the west and north-central regions of the United States.

The number of hospitals affiliating with HMOs or PPOs for the first time, consistent with the noted "S-shaped" trend in the number of cumulative affiliations, has steadily declined over the past decade. Hospitals affiliating for the first time declined from about 400 entrants in 1984 to 20 or less by the 1990s. The tapering of the increase in prevalence and the decreasing number of new entrants raise several questions. Do these trends indicate a maturation in industry-wide exchange relationships similar to product life cycles (Porter, 1980, p. 158), or a point of saturation in the practicable level of arrangements? If there is, in fact, a life-cycle process at work in hospital-DCA affiliations and that cycle has reached the stage of maturity, what does this say about the remaining, unaffiliated hospitals? Are these hospitals unwilling to secure affiliations with DCAs in order to buffer their independence and maintain their autonomy? If so, to what extent will they be able to successfully compete with those hospitals touting links to managed care, and their presumed potential for greater efficiency? Or are these hospitals unable to secure exchange arrangements with DCAs? If the latter case is evident, the future might be even bleaker than the prospect of competing without managed care linkages.

Influence of Organizational and Market Factors on New Affiliations (Research Question # 2)

With respect to organizational and market factors other than efficiency, the results offer a number of conclusions as to their influence on hospital affiliation strategies. The non-parametric analysis of prevailing hospital affiliations indicated those affiliated with HMOs or PPOs offered a greater mix of services, had greater involvement in medical education, and more frequently operated in the northeast and north central regions as compared to the south. Their markets had more competing community hospitals without great concentration in discharges and higher affiliation activity. Within the group of affiliating hospitals, several characteristics were found for differentiating between those affiliating with HMOs and those affiliating with PPOs. Analysis of the factors associated with hospitals affiliating for the first time, or continuously refraining from affiliating since 1984, narrowed the differences to just a few critical variables.

Hospitals offering a broad array of services beyond their inpatient "core" technology (SERVMIX) apparently have been more successful in securing and retaining stable DCA-based resource flows. The logit regression findings strongly pointed to the historical significance of "full service" hospitals in meeting the needs of DCAs: the presence of greater service mix was significantly related to hospitals affiliating with DCAs in 1985 and significantly related to prevailing hospital affiliations with DCAs in 1985, 1988 and 1991. Clearly the continued importance of a broad mix of services in securing new affiliations after 1985 is questionable.

Service mix had no net effect on influencing new affiliations with either HMOs or PPOs in 1988, nor was it significant in predicting with which DCA form hospitals would affiliate. But the continued importance of service mix in the **prevalence** of hospital affiliations with any form of DCA, and the **prevalence** of hospital affiliations with PPOs and both HMOs and PPOs (identified in the logit analysis of prevalence) suggests the majority of hospitals affiliating early in the decade (and therefore the bulk of prevailing affiliations later on) overwhelmingly relied on the advantage of having a broad array of services.

The level of affiliation activity in the market (RAFIL) in the year preceding a hospital's decision to affiliate was found influential for hospitals affiliating with DCAs for the first time in 1988, but without any net influence in 1985 or in 1991. The influence was also negative, in that greater affiliation activity reduced the likelihood hospitals would affiliate with either HMOs or PPOs. This finding is counterintuitive to the findings from the non-parametric comparisons of incidence (for 1985) and prevalence through 1991, and contradicts the logit analysis of prevalence (across all three time frames) that higher affiliation activities were associated with an increased likelihood the hospital would affiliate with a DCA of some form. It therefore appears RAFIL has not been a factor in influencing a hospital's decision to initially affiliate. The level of previous affiliation may offer, instead, a means for controlling variation in DCA market penetration and therefore serve as a good indicator of the acceptability of market affiliation activity.

Influence of Efficiency on Initial DCA Affiliations (Research Question #3)

With respect to measures of hospital efficiency, the analyses of prevailing hospital affiliations generally reflected that hospitals affiliated with DCAs, and those specifically affiliated with HMOs or with BOTH (but not PPOs) may have been more efficient in one or more measures. But the analyses of hospitals affiliating for the first time provided conflicting evidence. Non-parametric tests showed that hospitals affiliating with either HMOs or PPOs for the first time in 1985, compared to those not affiliated, were less productive (higher FTEBED), but were better in utilizing their hospital capacity (higher ROCUP). Logit analysis of newly affiliated hospitals indicated they had higher ROCUP as well, but that was the only statistically significant efficiency measure found. The non-parametric analyses also found the group of hospitals affiliating with HMOs as well as the group affiliating with PPOs were no more efficient (in all five measures) than non-affiliated hospitals, while those affiliating with both were less efficient in cost and average length of stay. The logit analysis of incidence also found that hospitals affiliating with HMOs for the first time had worse productivity but better cost efficiency.

These analyses suggest that hospital efficiency may not be a critically influential factor in the decision to affiliate with a DCA for the first time, at least since 1985, but that, over time, efficiency may become a key indicator of prevailing hospital affiliation patterns. This conclusion supports and extends the Kralewski et al. (1991) findings that price, at least with HMOs, was not a major consideration in

initial contracts, and that HMOs often helped contracting hospitals improve their efficiency. Improvement in efficiency at a later point in time may signal the difference between successful but temporary affiliations, and those producing more enduring exchange relationships. The finding that the relative occupancy rate (ROCUP) was significant and positive in affiliations with DCAs in 1985 may reflect the vestige emphasis of the early 1980s on filling empty beds, combined with the moderate association expected between larger hospitals and the ability to maintain higher occupancy rates.

Analysis of efficiency in the prevalence samples indicates at least five patterns may be emerging. First, the logit analysis indicates affiliated hospitals may, over time, become more efficient than unaffiliated hospitals, especially with respect to managing productivity (FTEBED) and technical efficiency. It also should be noted that wherever efficiency was found significant, its influence was always weaker than, or subordinated to the market factor RAFIL. This reflects how a hospital's cumulative market affiliation activity has been a greater predictor than its efficiency in identifying which hospitals affiliated with which DCAs.

Second, the logit findings show that, although higher occupancy relative to the market was important in distinguishing affiliated hospitals in 1985, its importance was supplanted by greater productivity and technical efficiency in later years. Third, efficiency has not been a hallmark of prevailing hospital-PPO relationships. This finding lends support for arguing that relationships with PPOs may provide hospitals a means for entering the managed care arena without significantly changing their practices.

Fourth, the influence of cost efficiency (COSTEF) has simply not been a critical factor in any new or prevailing relationships. Hospitals have apparently not promoted overall hospital cost efficiency in establishing resource exchange relationships with DCAs. The corollary to this finding might also be that DCAs have not consistently pursued affiliations with efficient hospitals. Similar to previous findings from the perspective of either the DCA, usually HMOs (Luft, Maerki & Trauner, 1986) or the market area (McLaughlin, 1988a), this finding from the hospital's perspective raises the concern that the system-wide cost impact of managed care may be dissipated by virtue of the ability of hospitals to shift costs elsewhere.

Lastly, the accumulated findings of the present study portray prevailing unaffiliated hospitals as generally small in capacity, patient volume and range of ancillary services, usually independent and not associated with multi-hospital systems. The non-parametric analysis showed unaffiliated hospitals had lower productivity, process efficiency, cost and technical efficiency. While newly affiliated hospitals were no more efficient upon affiliation than those refraining from affiliation, it appears equally evident, that over time, the body of unaffiliated hospitals examined cross-sectionally have been consistently less efficient by most common performance indicators. Whether the differential efficiency is because they were less efficient to begin with and have been surpassed by more aggressive hospitals, or because they were equally efficient but have failed to keep pace with the industry, remains for future research to resolve.

Summary of Hypotheses Tests

The findings of the present study partially or wholly supported four of the ten relationships hypothesized to explain hospital affiliation strategies with DCAs from the perspective of resource dependence. These hypotheses were supported predominantly from evidence of prevailing affiliations, and to a much lesser extent, from new affiliations.

With respect to the second research question addressing the association between affiliation and hospital factors, larger hospitals, in terms of volume in patient days (in 1985 and 1988) and mix of services (across all three time frames) were found more likely to affiliate with either HMOs or PPOs in prevailing relationships (Hypothesis 1). Hospitals with a greater range of ancillary services were also more likely initially to affiliate with DCAs.

The univariate and multivariate prevalence analyses also showed that larger hospitals (again, service mix over all three time periods, and patient days through 1988) were also more likely to affiliate with both HMOs and PPOs (Hypothesis 2). The emphasis of this hypothesis was not on initial affiliations, but those over time. This hypothesis was supported by prevailing affiliations. There was no discernible net effect of patient days and service mix on the likelihood of initial affiliations with both HMOs and PPOs using logistic regression methods and controlling for other factors.

Focusing on market factors associated with affiliation strategies, the hypothesis that hospitals in competitive environments were more likely to affiliate with DCAs

(Hypothesis 8) was supported by three of the four market variables in prevailing relationships under univariate analysis (positive HCOMP and RAFIL, and negative HHI), and one variable across all three time frames in the logit analysis (RAFIL). RAFIL was the only market factor found positively associated with initial affiliations with DCAs and with HMOs in 1985.

Lastly, with respect to the third research question focusing on the relationship between hospital efficiency and affiliation strategy, support was found for the hypothesis that hospitals affiliating with either HMOs or PPOs for the first time would be no more efficient than those not affiliating (Hypothesis 9). Non-parametric analysis indicated that DCA-affiliating hospitals were actually associated with lower productivity (higher FTEBED) in 1985 although they also had better process efficiency that year with higher relative occupancy rates (ROCUP). These measures of efficiency were not statistically significant in 1988 or 1991, nor were the other two measures significant in any of the years. The logit analysis further showed that a higher relative occupancy rate was the only positively significant efficiency measure, and then only for 1985.

The remaining six hypotheses (3 through 7 and 10) were not supported in this study. The influence of systems affiliation or involvement with medical education programs (Hypothesis 3) was found to have only sporadic association in the prevalence of affiliations, and no positive influence in new affiliations. The hypothesized relationships between hospital affiliation strategies and the institutional factors of autonomy and the need for critical resources did not materialize as expected

(Hypotheses 4-7). These hypotheses were not supported for several reasons, but usually because: (1) one or more of the variables was associated with the posited strategy, but in a direction other than hypothesized; (2) the expected influence was found in one variable, and not the other; or (3) the influence was intermittent across the years. Finally, the insufficient number of new affiliations at the HMO or PPO affiliation level required for the logit analysis prevented drawing any conclusions whether hospitals initially affiliating with HMOs were more efficient than those initially affiliating with PPOs (#10). The incidence analysis based on univariate statistics also found none of the four measures of efficiency significantly related to affiliations with either HMOs or PPOs (other than TECHEF in 1988).

Key Assumptions

This study made four assumptions about the nature of hospital affiliations with DCAs, and the methodology used to determine affiliation strategies and determinants. The first assumption was that the significant differences distinguishing HMOs from PPOs continue to be greater than the increasing differences, or variation, within HMOs and PPOs. Under this assumption, no distinction, or control, was made in the analyses as to the type of HMO or PPO with which the hospital affiliated. This assumption may have been particularly valid for most of the time period under study, but has become more tenuous in the 1990s as HMOs and PPOs experiment with product hybridization (Boland, 1991; Eldon, 1989; Feldman, et al., 1989).

Second, because the AHA asked in its annual survey whether the hospital had a formal written contract with an HMO or PPO, this study assumed these contracts represented distinct arms-length agreements between truly distinct organizations, rather than through mutual ownership by one of the two parties. This assumption was predicated on surveys showing that hospital ownership of HMOs (12%) and PPOs (14%) represented a clear minority of relationships by the end of 1991 (deLissovoy, et al., 1987; Fox & Heinen, 1987; Gold, 1991a; Marion Merrill Dow, 1992, "HMO" and "PPO" editions). Empirical research has also suggested HMO ownership by hospitals has declined since the early 1980s (e.g., Anderson, et al. 1985; Kralewski, et al., 1991). This assumption may have been incorrect for 1 in 10 hospitals if these hospitals, did, in fact, report formal contracts for DCAs they owned. But any error due to this assumption may be mitigated by theoretical arguments that even when organizations own various aspects of their production process, they might treat each "value-adding" unit as a distinct entity, subject to the same requirements and constraints placed on independent organizations (Badaracco, 1991; Harrigan, 1985).

The third assumption made in the specified model and theoretical application of resource-dependent arguments was that hospitals make rational, strategic choice decisions regarding DCA affiliations. The resource dependence paradigm assumes hospitals, like other organizations, do not engage in these contracts unwittingly, and do so only after balancing the need for critical resources with the desire for retaining autonomy. The finding in this study of isomorphic tendencies by hospitals pursuing DCA affiliations might imply, however, that presumed, long-term strategic gains from

affiliation undertaken for simply imitative purposes, may supersede near-term requirements for economically-based rationality in committing to contracts.

Lastly, by left censoring the data, for example, in 1983 and 1984 before examining hospital and market determinants of affiliation in 1985, the design assumed prior experience was actually controlled. Controlling for prior affiliations presumed the data accurately reflected whether a hospital affiliated or not, and that censoring in 1983 and 1984 sufficiently negated, or controlled, for prior experience. It was assumed there were few, if any, hospitals that had affiliated and then ceased their affiliation prior to 1983 that were not censored in 1983 and 1984.

Limitations of the Methodology

The multiple cross-sectional design using time series data employed here suffers from a number of limitations that must be noted. First, caution must be exercised in inferring causality from any demonstrated relationships in the absence of a completely experimental design. This caution is somewhat, but not entirely, mitigated by the research design used in the study. One-year lagged variables were used to examine the incidence of affiliation in order to capture the temporal component required between the presumed causal factor and the resulting strategy outcome. The appropriateness of lagging variables by one year, as opposed to some other period, remains debatable.

Second, the sample restrictions limited generalizability of the findings to

community hospitals in urban areas. Generalizing these findings to rural, long term or highly specialized institutions may not be appropriate. The sampling strategy provided an insufficient number of observations to successfully use the logit technique for analysis of new affiliations, particularly from 1988 onward. It is conceivable, however, that any sampling strategy would have encountered this constraint, since fewer hospitals remained to pursue DCA affiliation strategies for the first time by the 1990s.

The third limitation of the study was due to constrained knowledge of only the presence or absence of a DCA contract. In only reflecting the presence of any contract, without providing detail as to the number of contracts, number of lives covered by each contract, or the nature of exchange involved (e.g., method or amount of reimbursement, ownership, risk, etc.), this study could not mine the richness of varying degrees of interdependencies nor the extent to which singular relationships have endured. This limitation represents an important area for future research as richer databases become available to provide detailed patient-level and contract-level information.

The absence of specific information about the participating DCAs presented a fourth limitation in ignoring DCA factors such as size, ownership and operational experience that could potentially influence affiliation patterns as well. This limitation, without additional information, inhibited the study from progressing to the next logical step of evaluating the mutual interdependencies of the contracting parties, and their influence on the other's performance. This exploratory study has relied on a single

stage equation model to estimate the affect of hospital and market factors, and leaves to future research the development and testing of multiple stage, multiple equation models to address the simultaneity issue.

The fifth limitation rests on the parsimony of the model used to analyze factors influencing the presence or absence of DCA contracts. The scope of this study has been purposely focused on two sources considered most influential in hospital affiliation strategies, their organizational attributes and some of their market features. The model is flexible, however, and may be modified through subsequent research to extend its domain.

The noted concerns about multicollinearity was the sixth limitation, especially among the market variables (market share, Herfindahl index) and the interaction of a hospital's relative occupancy rate in the market and its market share. While necessary for operationalizing the theorized resource-dependent hypotheses, these variables required substantial latitude in interpretation. Multicollinearity also may have contributed to the lack of significance of these variables.

This chapter presented and discussed the major findings of the study, addressed its methodological assumptions and identified several limitations. Irrespective of the constraints imposed by the assumptions and limitations, the study nevertheless extends the body of knowledge by adding to the theoretical and empirical understanding of managed care from the hospital's perspective. This study has described how the scope of hospital affiliations with DCAs has changed over the past eight years, and identified factors associated with those affiliations, initially and over time.

CHAPTER 7
IMPLICATIONS AND CONCLUSIONS

This study identified the extent to which hospital affiliations with HMOs and PPOs have increased along an "S-shaped" growth curve between 1984 and 1991. The relative uniformity of this growth curve was consistent across many hospital classifications, for affiliations with distribution channel agents in general, as well as with HMOs and PPOs specifically. The vast majority of community hospitals in America (83%) had some form of affiliation with DCAs by 1991, but the growth in prevailing affiliations has leveled off, and the number of hospitals affiliating for the first time declined to less than 20 each year.

The identified trends provide policy makers empirical data over an eight year period for understanding the rapidity with which hospitals have advanced a major strategy change in a direction many would have considered improbable a decade earlier. The rapidity and persistence of this strategy diffusion has implications for public policy that must consider the reaction of hospitals to health care reform involving network-based managed competition. Policy makers must also consider the future consequences in an environment of managed competition for the remaining 17% of the total community hospital population that was unaffiliated in 1991, and particularly the "core" 3% that had remained unaffiliated since 1984.

This study also found that the cumulative population of affiliated hospitals may

be more efficient than non-affiliated hospitals in certain aspects. This finding lends partial support for advocating managed care as a means for instilling greater efficiency in the health care marketplace. The finding that efficiency is not a good predictor of initial hospital affiliation, does, however, contradict much of the conventional wisdom that managed care networks, especially HMOs, seek out and incorporate "preferred," efficient providers, at least with respect to hospitals. The generally consistent finding that cost efficiency, after controlling for other factors, has little relationship to initial or prevailing DCA affiliations adds to the body of empirical knowledge of the limitation of managed competition through networks to directly influence hospital costs.

Previous investigations of hospital-HMO contracts in the mid 1980s determined that hospital attributes such as the availability, scope and location of hospital services were more critical factors than the price of services in leading to successful contracts (Kralewski, et al., 1992). The results of this study support these conclusions in finding service mix influential, while there was no association between efficiency and initial affiliation.

Hospitals have adapted to significant changes in their fiscal, regulatory, political and professional environments (Stevens, 1991). The prevailing posture of hospitals as independent and relatively autonomous institutions has dramatically changed over the past decade or so, as hospitals show increasing willingness to align

their activities with multi-hospital systems, alliances and networks of providers and insurers (Mohr, 1992). Their increasing willingness to participate in resource exchange relationships with HMOs and PPOs suggests a new direction for adapting to the prevailing "locus of control," as Havighurst (1986) would label the emerging source of industry power.

Directions for Future Research

Notwithstanding the noted methodological limitations, this exploratory study provides an important theoretical and empirical foundatio or continued analysis of the scope of hospital affiliations with DCAs. The present analysis succeeded in identifying some of the possible factors influencing a hospital's propensity to affiliate with particular DCAs. While little evidence supported a relationship between hospital efficiency and the incidence of initially affiliating with a DCA, evidence was presented indicating there are distinct differences in the efficiency of prevailing affiliations. Future research might consider a number of strategies for refining the model and analytic strategy, especially as richer databases develop. The model should be extended to address the potential simultaneous influences of DCA selection of hospitals as well as hospital selection of DCA. The analytic strategy could examine the exchange relationships using cohort and event history analyses to understand how the influence of critical factors change over time, such as hospital efficiency in a cohort of hospitals. Extension of the exploratory model developed in this study,

combined with richer databases and other analytic techniques, could therefore be used to answer several important follow-on research questions:

- What is the relationship between a hospital's affiliation with a DCA over time, and its efficiency?
- Does a hospital's efficiency improve over time after affiliating wi)CA, relative to others that have not affiliated during that time?
- How influential a role will a hospital's efficiency, especially its cost efficiency, be in the establishment of exchange relationships with DCAs in the future?"
- What are the salient market and institutional attributes of those hospitals that are the first to affiliate with DCAs in their own markets?
- What are the long term survival implications for non-affiliating hospitals?
- As hospitals and managed care networks evolve in their management of costs, utilization and exchange relationships, to what extent have, and will, DCAs consider a hospital's "full service" capabilities a significant factor?
- How does the intensity of DCA contracting (number of contracts, size and scope of enrollment, etc.) influence hospital affiliation strategies?

This study has attempted to illuminate the scope of hospital involvement in managed care activities, and to provide a profile of the hospital and market characteristics associated with hospital-network affiliations. Hospital-DCA exchange relationships will continue to be relevant in the future of health care delivery in America so long as managed care and its evolving successors offer hope in containing the costs or improving the quality of health care. The present research will hopefully provide the basis for further exploration of the many issues related to hospital relationships with managed care networks such as HMOs and PPOs.

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APPENDICES

APPENDIX A

DEFINITION OF SERVICE MIX

Hospital-based mix of services is based on a subset of all facilities and services reported to the American Hospital Association during the period 1984 to 1991. The subset is selected for several reasons: to provide consistency over the study period because the number of services asked by the AHA differ during the period, and the subset represents those services consistently surveyed, (2) to create a measure permitting as much variation in the types of services offered, while providing a relatively parsimonious measure, and (3) to create a continuous measure for multivariate analysis.

Computation of a hospital's service mix is predicated on its reporting up to 10 possible services. The degree to which the hospital provides these services is captured by computing the ratio of its mix of services to the 10 selected services. Expressed as a percentage, values may range from a low of 0 to a high of 1.0. Service mix comprises the following services:

1. Outpatient Alcoholism/Chemical Dependency
2. Separately Identified Emergency Department
3. Community Health promotion
4. Blood Bank Services
5. Organized Outpatient Services
6. Occupational Therapy
7. Physical Therapy
8. Outpatient Rehabilitation Services
9. Outpatient Psychiatric Services
10. Hospice

APPENDIX B

DEFINITION OF HOSPITAL REGIONS

REGION	AHA REGION	STATES
NORTHEAST	Region #1	Maine New Hampshire Vermont Massachusetts Rhode Island
	Region #2	New York New Jersey Pennsylvania
NORTHCENTRAL	Region #4	Ohio Indiana Illinois Michigan Wisconsin
	Region #6	Minnesota Iowa Missouri North Dakota South Dakota Nebraska Kansas
WEST	Region #8	Montana Idaho Wyoming Colorado New Mexico Arizona Utah Nevada
	Region #9	Washington Oregon California Alaska Hawaii
SOUTH	Region #3	Delaware Maryland Dist. of Columbia Virginia West Virginia North Carolina South Carolina Georgia Florida
	Region #5	Kentucky Tennessee Alabama Mississippi
	Region #7	Arkansas Louisiana Oklahoma Texas

APPENDIX C

COMPUTING EFFICIENCY SCORES USING DATA ENVELOPMENT ANALYSIS

In using linear programming techniques to search for optimal combinations of inputs and outputs, data envelopment analysis (DEA) is useful for evaluating the actual performances of hospitals relative to others included in the sample, without relying on external standards of performance which may be unrelated or arbitrary (Bannick & Ozcan, in press). The program evaluates the technical efficiency of each hospital relative to optimal patterns of production computed using the performance of hospitals whose input/ output combinations are not bested by those of any other comparison or peer hospital. Ozcan and Luke (1993) present and explain the linear programming formula used by DEA, adapted from Charnes and Cooper (1980, pp. 721-722).

In the DEA formula, the weights for the outputs and inputs, respectively, define the activities of each analyzed hospital. Each hospital becomes a focal hospital, in turn, when its efficiency score is computed. It is important to note that input and output values as well as all weights are assumed to be greater than zero. The weights for each hospital are determined entirely from the output and input data of all hospitals in the peer group. Therefore, the weights used for each hospital are those that maximize the focal hospital's efficiency score. Hospitals that require relatively more weighted inputs to produce weighted outputs or, alternatively, produce less weighted output, per weighted inputs, than do hospitals defined by the program to be on the efficiency frontier, are considered technically inefficient (Charnes, Cooper & Rhodes, 1978; Charnes, Cooper, Lewin, Morey, and Rousseau, 1985; Morey, Fine, and Loree, 1990; Rosko, 1990).

The present study of hospital technical efficiency based on selected inputs and outputs employs variables similar to those found in current research:

$$\text{TECHEF} = f \; \frac{(\text{ADMIT, SURG})_{\text{outputs}}}{(\text{BEDS, FTE, SERVMX, SUPPLY})_{\text{inputs}}}$$

Output variables include the total annual reported number of adjusted admissions (ADMIT) and total number of annual inpatient and outpatient surgical procedures (SURG). Input variables provide factor measurements for the hospital's use of capital, labor and supply resources (Bannick & Ozcan, in press; Ozcan & Bannick, 1993). Two variables assess capital investment, the total number of staffed and licensed beds (BEDS), and the mix of services supported (SERVMIX). SERVMIX is

computed as described earlier in the methodology section. Hospital labor is measured by the hospital's total full and part-time equivalent staff (FTE); that is, the sum of all full time equivalent and one-half the number of part time equivalent staff (AHA Guide, 1992). Total expenses excluding payroll, capital or depreciation expenses serve as a proxy measure for supply resources used by the hospital (SUPPLY).

One concern for these measurements rests on whether surgical procedures can be considered the "end-products" of hospital activity, or an intermediate product or service. This concern expresses the questionability of using surgical procedures in lieu of other, more commonly cited outputs such as discharges or patient days. Surgical procedures were selected for several reasons as indicative of significant outputs produced by hospitals during the past 10 years. First, the proportion of hospital surgeries produced in an outpatient basis has steadily increased during that time, reaching over half of the average hospital's surgeries by the early 1990s (Green, 1992). This statistic suggests the increasing trend of shifting resources to the outpatient and less acute setting (Goldsmith, 1988), with the implication these procedures do, in fact, increasingly represent a final output service. Secondly, because adjusted admissions are used to account for both inpatient and outpatient activity, surgical procedures presents another unique dimension of hospital operations. Surgical procedures also provide a means for distancing the resulting technical efficiency measure from severe collinearity with the adjusted days (DAYS) measures used in the analysis. Finally, DEA has been found to be relatively insensitive to measurement variation (Ozcan, 1993). Ozcan's continuing study of the sensitivity of DEA to measurement variation has found the model to be fairly robust relative to a wide variety of input and output combinations and alternative approaches to measurement. Ozcan notes the vast majority of alternative measures tend to be correlated within the range of 0.8 to 0.98 (Pearson product moment correlation). This study provides moderate corroboration of Ozcan's findings following analysis of 417 community hospitals in 1989 showing significant correlation between technical efficiency scores using two models similar to the above specification, but with one using total visits and the other using surgical procedures ($r = 0.64$, $P < 0.0001$).

The sampling methodology used in this study controls for significant variation in hospital technical efficiency attributable to urban/rural and service/patient differences since only those institutions designated as community hospitals located in MSAs are examined. Influences on hospital technical efficiency due to differences in local MSA markets (e.g. population concentration, urban wage indexes and physician availability) and potential economies of scale are further controlled by creating pools of hospitals within each year based on a 2 X 3 tables using two factors, size of the MSA and bed size of the hospital. Following the logic of Ozcan and Luke (1993), hospitals were first assigned on the basis of MSA population. Unlike the Ozcan and Luke study which pooled hospitals into one of 3 population categories (under 250,000, between 250,000 and 500,000; and 500,000 to 1,000,000), hospitals in this study were grouped into 1 of 2 categories, following the metropolitan statistical area size

categories used by the AHA (1992, Guide): (1) under 1 million inhabitants (combining the first four AHA categories; and (2) over 1 million. Hospitals were then assigned to one of three size categories within each of the two MSA population categories (small, with less than 100 beds; medium, with between 100 and 299 beds; and large, with 300 or more beds).

Differences in patient severity were controlled by adjusting the hospital output of adjusted admissions (which account for both inpatient and outpatient activities similar to adjusted patient days) by multiplying adjusted admissions by the computed severity (SEVERITY) value for that year. In this fashion, hospitals with the highest severity index value of 1.0 would not reflect any change in their adjusted admissions, whereas hospitals with lower severity would reflect commensurately lower adjusted admissions. Because technical efficiency scores are computed using these peer groupings within a single year, there was no need to adjust supply costs for inflation.

The conditions specified above resulted in performing 48 DEA modules (6 MSA-based peer groups for each of the 8 years studied, 1984-1991) using the Integrated Data Envelopment Analysis System (IDEAS, version 3.0.5) developed by Ali (1991). The hospital peer groups analyzed ranged from the smallest peer group involving 181 hospitals (those hospitals in 1984 having less than 100 beds and located in MSAs having over 1 million inhabitants), to the largest involving 654 hospitals (those medium-sized hospitals with between 100 and 299 beds in 1990 located in MSAs with less than 1 million population. Input data were scaled prior to using DEA, as suggested by Ali, so no scale options were invoked, while permitting the model to develop the efficiency envelop using variable returns to scale. Because values within given inputs and outputs reflected wide variation, DEA was conditioned using the invariant option.

APPENDIX D

COMPUTATION OF HIRSCHMAN-HERFINDAHL INDEX

The Hirschman-Herfindahl Index (HHI) is based on discharge data in the metropolitan statistical area and computed as follows:

$$H_i = \sum_{u=1}^{n} (S_{ij})^2$$

where:

H_i = HHI for market area$_i$, ranging from $(1/n) \leq H_i \geq 1$.

n = Total number of hospitals in the MSA market.

S_{ij} = Marketshare of hospital$_j$ in market$_i$.

H_i = 1 indicates monopolistic market conditions

APPENDIX E

STATES WHERE HMOS AND PPOS WERE NOT PRESENT

YEAR: Number of States Without Both an HMO and a PPO	HMO (Source)	PPO (Source)
1984: 22 states	6: Alaska, Wyoming, Mississippi, S. Dakota, Idaho, Montana (MMD, 1987)[1]	21: Alaska, Wyoming, S. Dakota, N. Dakota, Idaho, Montana, Hawaii, Washington, New Mexico, Texas, Nebraska, Kansas, Tennessee, S. Carolina, W. Virginia, Connecticut, Rhode Island, N. Hampshire, Vermont, Delaware, Maine (AMCRA, Dec 1986)[2]
1985: 16 states	8: Alaska, Wyoming, Mississippi, S. Dakota, Idaho, Montana, W. Virginia, Maine (MMD, 1987)	14: Alaska, Wyoming, S. Dakota, N. Dakota, Idaho, Montana, Hawaii, Nebraska, Connecticut, Rhode Island, N. Hampshire, Vermont, Delaware, Maine (AMCRA, June 1985)
1986: 10 states	3: Alaska, Montana, W. Virginia (MMD, 1987, 1988)	9: Alaska, S. Dakota, N. Dakota, Idaho, Montana, Rhode Island, N. Hampshire, Delaware, Maine (AMCRA, Dec 1986)
1987: 10 states	2: Alaska, W. Virginia (MMD, 1988, 1989)	8: S. Dakota, N. Dakota, Idaho, Montana, Rhode Island, N. Hampshire, Delaware, Maine (AMCRA, Dec 1987)
1988: 13 states	3: Alaska, Mississippi, W. Virginia (MMD, 1989,1990)	11: Alaska, S. Dakota, N. Dakota, Wyoming, Idaho, Montana, Vermont, Rhode Island, N. Hampshire, Delaware, Maine (MMD 1989)
1989: 12 states	4: Alaska, Mississippi, W. Virginia, Wyoming (MMD, 1990, 1992)	10: Alaska, S. Dakota, N. Dakota, Wyoming, Idaho, Montana, Vermont, Rhode Island, Delaware, Maine (MMD 1990)
1990: 4 states	4: Alaska, Mississippi, W. Virginia, Wyoming (MMD, 1992)	PPOs present in all states (MMD, 1991)
1991: 4 states	4: Alaska, Mississippi, W. Virginia, Wyoming (MMD, 1992)	PPOs present in all states (MMD, 1992)

NOTE:

1. MMD- Marion Merrell Dow: includes HMO Editions and Managed Care Digests, from data provided by SMG Marketing Group Inc., Chicago, IL.
   1987- Managed Care Digest, Update, reporting through December 31, 1986
   1988- same, update edition, reporting through December 31, 1987
   1989- same, update edition, reporting through mid-year 1989
   1989- PPO Edition, reporting through December 31, 1988
   1990- Managed Care Digest, Update and HMO Editions, reporting through December 31, 1989
   1990- PPO Edition, reporting through Dec 1989
   1991- PPO Edition, reporting through Dec 1990
   1992- HMO Edition, reporting through Dec 1991
   - PPO Edition, reporting through Dec 1991

2. AMCRA- American Medical Care Review Association

APPENDIX F

INDEXES OF MEDICAL CARE PRICES: 1984-1991

Costs in this analysis were adjusted for inflation using the hospital room component of the consumer price index for medical care services, Statistical Abstract of the United States (1991, Table No. 152, page 99 for 1984 index; 1992, Table No. 740, p. 471, for 1985-1991 indexes, where 1982 = 100):

1984- 109.0
1985- 115.4
1986- 122.3
1987- 131.1
1988- 143.3
1989- 158.1
1990- 175.4
1991- 191.9

APPENDIX G

Initial Study Sample Size and Relationship to U.S. Community Hospitals

Sample Year	(1) All AHA Hospitals	(2) U.S. Community Hospitals	(3) U.S. Urban Community Hospitals	(4) U.S. Urban Community in States With HMOs/ PPOs	(5) After Deleting Coding Anomalies	(6) Non-Responding Hospitals	(7) (5-6) Final Sample Size	(8) DCA-Affiliating Hospitals	(9) (3-4) Hospitals in States With No HMOs/ PPOs	(10) Final Sample as a % of U.S. Community Hospitals	(11) Final Sample as a % of All AHA Hospitals	(12) Non-Response as a % of (5)
1983	7,120	5,865	3,106	NA	NA	211	2,895	NA	NA	49.4%	40.7%	6.8%
1984	7,110	5,840	3,103	2,486	2,452	338	2,114	1,185	617	36.2%	29.7%	13.8%
1985	7,102	5,8.3	3,091	2,932	2,897	242	2,655	1,666	159	45.8%	37.4%	8.4%
1986	7,064	5,745	3,074	2,991	2,959	352	2,607	1,970	83	45.4%	36.9%	11.9%
1987	7,052	5,677	3,051	2,968	2,931	230	2,701	2,116	83	47.6%	38.3%	7.8%
1988	7,037	5,602	3,021	2,914	2,865	205	2,660	2,161	107	47.5%	37.8%	7.2%
1989	6,961	5,513	2,984	2,888	2,830	202	2,648	2,175	96	48.0%	38.0%	7.1%
1990	6,871	5,442	2,950	2,902	2,860	197	2,663	2,198	48	48.9%	38.8%	6.8%
1991	6,829	5,388	2,942	2,895	2,849	224	2,625	2,191	47	48.7%	38.4%	7.9%
AVER AGE (1984-1991)	7,005	5,626	3,027	2,872	2,833	249	2,584	1,958	155	45.9%	36.9%	8.8%

APPENDIX H

Table H-1. Analysis of Response Bias: 1984 and 1991

	1984			1991		
Attribute	Responding Mean (SD) (n=2,114)	NonResponding Mean (SD) (n=338)	Wilcoxon 2-Sample Z-Value	Responding Mean (SD) (n=2,025)	NonResponding Mean (SD) (n=224)	Wilcoxon 2-Sample Z-Value
Public	0.14 (0.35)	0.16 (0.37)	0.99 ns	0.13 (0.34)	0.11 (0.32)	-.82 ns
Private, NFP	0.73 (0.45)	0.51 (0.50)	-7.90***	0.71 (0.45)	0.42 (0.50)	-9.0***
Private, IO	0.13 (0.34)	0.33 (0.47)	9.1***	0.16 (0.36)	0.46 (0.50)	11.5***
System Member	0.39 (0.49)	0.40 (0.49)	0.37 ns	0.47 (0.50)	0.02 (0.13)	-13.1***
Contract Managed	0.08 (.27)	0.04 (.21)	-2.35*	0.07 (0.26)	0.00 (0.07)	-3.86***
Alliance Member	NR	NR		0.52 (0.47)	0.01 (0.09)	-9.72***
Number of Beds	269.7 (201.5)	198.2 (180.98)	-7.76***	253.9 (195.9)	166.1 (163.1)	-8.42***
Hospital Beds:						
Small (1-99)	0.20 (0.40)	0.33 (0.47)	5.63***	0.20 (0.40)	0.41 (0.49)	7.12***
Med (100-299)	0.45 (0.50)	0.48 (0.50)	1.07 ns	0.48 (0.50)	0.45 (0.50)	-.76 ns
Large (300+)	0.36 (0.48)	0.19 (0.39)	-6.02***	0.31 (0.46)	0.14 (0.35)	-5.42***
Patient Days	71,435 (61,079)	49,911 (54,454)	-8.02***	63,702 (58,027)	37,701 (47,136)	-9.02***
FTEs	881.1 (857.8)	598.6 (714.3)	-8.30***	1,056.2 (1,030.9	565.7 (706.7)	-9.98***
Occupancy Rate	0.67 (0.16)	0.61 (0.17)	-6.47***	0.63 (0.17)	0.53 (0.18)	-7.75***
ALOS	7.4 (3.00)	7.20 (3.08)	-2.24*	7.36 (3.88)	7.35 (3.99)	0.06 ns
SEVERITY Index	0.066 (0.089)	0.025 (0.045)	-14.01***	0.103 (0.097)	0.003 (0.016)	-20.14***
SERVMIX	0.57 (0.21)	0.29 (0.31)	-15.35***	0.65 (0.19)	0.02 (0.10)	-24.6***
Presence of Residency	0.33 (0.47)	0.21 (0.41)	-4.11***	0.34 (0.47)	0.16 (0.36)	-5.5***
No. Residents	22.0 (65.0)	16.40 (52.3)	-1.06 ns	23.97 (77.40)	7.81 (35.23)	-.56 ns
Member, COTH	0.13 (0.34)	0.08 (0.27)	-2.67**	0.04 (0.19)	0.06 (0.24)	1.79 ns
JCAHO Accredit	0.91 (0.28)	0.83 (0.37)	-4.48***	0.92 (0.27)	0.79 (0.41)	-6.72***
NRTHEAST	0.24 (0.43)	0.23 (0.42)	-24 ns	0.22 (0.42)	0.16 (0.37)	-2.15*
NRTHCENT	0.29 (0.45)	0.20 (0.40)	-3.46***	0.24 (0.43)	0.11 (0.32)	-4.36***
WEST	0.22 (0.41)	0.29 (0.45)	2.8**	0.19 (0.39)	0.42 (0.49)	8.10***

*significant at $p \leq 0.05$ **significant at $p \leq 0.01$ ***significant at $p \leq 0.001$
using the Wilcoxon 2-Sample Test (Normal approximation, continuity correction of .5).

TABLE B-3

Descriptive Statistics: Means, Standard Deviations and Intercorrelations of Study Variables
U. S. Urban Community Hospitals in 1974 (N = 2154)

VARIABLES	MEAN	STD DEV	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
ORGANIZATIONAL																									
1 PUBLIC	0.14	0.35																							
2 PROP	0.13	0.34	-.16***																						
3 RENTAL	0.39	0.49	-.34***	.22***																					
4 BED	81,025	71,302	-.03	-.28***	-.09*																				
5 OCCPCT	0.57	0.21	-.09***	-.28***	.02	.03***																			
6 VISITSPC	22.0	65.0	.00	-.28***	-.05***	.15***	.26***																		
7 OCCPCTU	0.07	0.07	-.01	-.09***	.00	.39***	.29***	.12***																	
8 OCCPCTR	0.24	0.13	-.12***	-.17***	-.12***	.25***	.26***	.20***	-.03*																
9 OCCPCTC	0.29	0.09	-.00	-.23***	-.02	.01	.11***	.01	-.07**	-.28***															
10 VISIT	0.22	0.11	-.00	.23***	.23***	-.28***	-.03***	-.05***	.15***	-.28***	-.23***														
11 PTDAYS	2,300	4,000	.01	.03*	-.01	-.28***	-.17***	-.05***	-.05***	-.03	.03***	-.05***													
12 OCCUP	1.00	0.95	.02	-.23***	-.02	.23***	.29***	.20***	.05***	.01	.02	-.01	-.03***												
13 OCCOC	1.00	1.79	-.02	.02	-.03*	-.24***	-.13***	-.05***	-.79***	.03***	.05***	-.17***	.73***	-.79***											
14 COUNTY	250,001	511,693	-.00	.14***	.01	-.27***	-.16***	-.03**	-.05***	-.05***	.07***	.01	.05***	-.05***	.05***										
15 OCCPCT	0.66	0.22	-.09***	.09	.01	.23***	.06	.05***	.20***	-.01*	-.01	.00*	-.23***	.23***	-.17***	-.23***									
BUDGET																									
16 OCCPCT	27.96	29.02	-.16***	.03***	.01	.05**	.05**	.23***	.01	.23***	-.05**	.14***	.01	-.05**	-.23***	.23***	.01								
17 OCCPCTR	0.11	0.10	.05**	-.23***	-.01	.05***	.23***	.03***	.15***	-.05*	.05**	-.14***	-.13***	.23***	.03	-.23***	.17***	-.79***							
18 OCC	0.16	0.08	.12***	-.05*	-.02	-.23***	-.03***	-.23***	-.01	-.23***	.03	-.23***	.03	.03*	.15***	-.03***	-.03	-.99***	.77***						
19 OCCTL	0.55	0.20	-.01	.03***	.23***	-.03***	.03***	.02	.03***	-.23***	.03	.01***	.03	-.07**	-.23***	.03***	.01	.24***	-.23***	-.23***					
20 OCCP*OCCPCT	0.14	0.26	.03	-.23***	-.03	.03***	.21***	.12***	.03***	-.01	.03***	-.23***	-.03***	.73***	-.03***	-.73***	.23***	-.53***	.73***	.23***	-.23***				
BUDGET																									
21 OCCTL	0.56	0.20	-.16***	-.03	.03**	.11***	.24***	.12***	.23***	-.23***	.05*	.23***	-.03***	.03***	-.23***	-.03	.03***	.24***	-.03***	-.23***	.53***	-.01			
22 OCCTL	0.07	0.20	-.03***	-.03*	.01	.23***	.21***	.23***	.23***	-.01	.03***	.13***	-.23***	.21***	-.23***	-.03*	.07**	.23***	-.03***	-.23***	.03***	.01	.53***		
23 OCCTL	0.31	0.06	-.04*	.07***	.07***	.01	.12***	-.01	.12***	-.23***	-.01	.23***	-.03*	.03	-.23***	.01	.03*	.23***	-.03***	-.23***	.23***	-.01	.03***	.23***	.03***
24 OCCTL	0.22	0.03	-.03	.03*	.03*	.03**	.14***	.01	.14***	-.23***	.01	.23***	-.03***	.03**	-.17***	-.01	.03*	.23***	-.03***	-.23***	.23***	-.01	.03***	.23***	.03***

* p < .05 ** p < .01 *** p < .001

APPENDIX I

Table I-1
Prevalence of U.S. Urban Community Hospital Affiliations, By DCA and Year: 1984-1991

	1984	1985	1986	1987	1988	1989	1990	1991
Total AHA Reporting Hospitals	7,110	7,102	7,064	7,052	7,037	6,961	6,871	6,829
Responding Urban Community Hospitals	2,146	2,690	2,638	2,736	2,707	2,684	2,703	2,669
Hospitals Affiliating With DCAs	1200	1680	1989	2137	2189	2200	2223	2220
Percent of Responding Hospitals	55.9%	62.5%	75.4%	78.1%	80.9%	82.0%	82.2%	83.2%
Hospitals Affiliating with HMOs	1017	1442	1769	1909	1953	1937	1940	1983
Percent of Responding Hospitals	47.4%	53.6%	67.1%	69.8%	72.1%	72.2%	71.8%	74.3%
Percent of Affiliating Hospitals	84.8%	85.8%	88.9%	89.3%	89.2%	88.0%	87.3%	89.3%
Hospitals Affiliating with PPOs	652	1112	1507	1707	1805	1879	1925	1965
Percent of Responding Hospitals	30.4%	41.3%	57.1%	62.4%	66.7%	70.0%	71.2%	73.6%
Percent of Affiliating Hospitals	54.3%	66.2%	75.8%	79.9%	82.5%	85.4%	86.6%	88.5%
Hospitals Affiliating with BOTH	469	874	1287	1479	1569	1616	1642	1728
Percent of Responding Hospitals	21.9%	32.5%	48.8%	54.1%	58.0%	60.2%	60.7%	64.7%
Percent of Affiliating Hospitals	39.1%	52.0%	64.7%	69.2%	71.7%	73.5%	73.9%	77.8%
Hospitals Affiliating with Neither HMOs/PPOs	946	1010	649	599	518	484	480	449
Percent of Responding Hospitals	44.1%	37.5%	24.6%32	21.9%	19.1%	18.0%	17.8%	16.8%
Percent of Affiliating Hospitals	78.8%	60.1%	.36%	28.0%	23.7%	22.0%	21.6%	20.2%

Notes:

1. Numbers and percentages will exceed the total number of hospitals and 100%, respectively, each year, beginning with the row labeled "Affiliating with HMOs". In 1984, for example, 1,017 of 1,200 hospitals affiliating with DCAs did so with HMOs, and of those 1,017, 469 also affiliated with PPOs. Similarly, 469 of the 652 hospitals affiliating with PPOs in 1984 also affiliated with HMOs.

2. Because these data do not require eliminating observations due to missing or erroneous data, the total number of responding hospitals here will exceed the final sample size used in subsequent analyses of prevalence.

APPENDIX I
Table I-2.
Prevalence of Hospital Affiliations with Either HCA Form (AFFIL) (1984-1991)

	YEAR							
	1984	1985	1986	1987	1988	1989	1990	1991
Total AHA Reporting Hospitals	7118	7102	7064	7052	7037	6961	6871	6829
Responding Urban Community Hospitals	2146	2698	2638	2736	2707	2684	2703	2689
% OF ALL AHA REPORTING HOSPITALS	30.1%	37.8%	37.3%	38.8%	38.4%	38.5%	39.3%	39.4%
All responding hospitals affiliating with either HCA	1200	1680	1989	2137	2189	2200	2223	2220
Percent of urban community hospitals	55.9%	62.3%	75.4%	78.1%	80.9%	82.0%	82.2%	83.2%
Responding System-affiliated hospitals	821	976	1096	1173	1224	1228	1255	1290
No. affiliating with either HCA	491	694	859	949	1028	1061	1078	1091
Percent of all responding, affiliating hospitals	40.9%	41.3%	43.2%	44.4%	47.0%	48.2%	48.5%	49.1%
Percent of all System-affiliated hospitals	59.8%	71.1%	78.3%	80.9%	84.0%	86.4%	85.9%	87.3%
Responding Independent hospitals	1325	1714	1568	1563	1483	1546	1448	1419
No. affiliating with either HCA	709	986	1130	1188	1161	1139	1145	1129
Percent of all responding, affiliating hospitals	59.1%	58.7%	56.8%	55.6%	53.0%	51.0%	51.5%	50.9%
Percent of all Independent hospitals	53.5%	57.5%	73.4%	76.0%	78.3%	73.7%	79.1%	79.6%
Responding Public Hospitals	311	394	378	397	383	364	378	356
No. affiliating with either HCA	136	210	255	265	267	273	282	271
Percent of all responding, affiliating hospitals	11.3%	12.5%	12.8%	13.3%	13.1%	12.6%	12.7%	12.2%
Percent of all Public hospitals	43.7%	53.3%	67.5%	71.8%	74.9%	75.0%	76.2%	76.1%
Responding Private, Investor-Owned Hospitals	278	415	421	469	452	448	432	420
No. affiliating with either HCA	154	237	297	342	344	351	335	326
Percent of all responding, affiliating hospitals	12.8%	14.1%	14.9%	16.0%	15.7%	16.0%	15.1%	14.7%
Percent of all Private, IO hospitals	55.4%	57.1%	70.5%	74.3%	76.1%	78.3%	77.5%	77.6%
Responding Private, Not-For-Profit Hospitals	1557	1881	1839	1879	1872	1872	1901	1883
No. affiliating with either HCA	918	1233	1437	1518	1558	1576	1606	1623
Percent of all responding, affiliating hospitals	75.8%	73.4%	72.2%	70.7%	71.2%	71.6%	72.2%	73.1%
Percent of all Private, NFP hospitals	58.4%	65.6%	78.1%	80.4%	83.2%	84.2%	84.5%	85.7%
Responding Contract-Managed hospitals	172	242	216	233	225	219	197	192
No. affiliating with either HCA	89	128	158	175	172	171	159	158
Percent of all responding, affiliating hospitals	6.7%	7.6%	7.9%	8.2%	7.9%	7.8%	7.2%	7.1%
Percent of all Contract-managed hospitals	46.5%	52.9%	73.1%	75.1%	76.4%	78.1%	80.7%	82.3%
Responding Alliance-member hospitals	NR	NR	576	712	784	812	838	837
No. affiliating with either HCA			402	611	701	725	739	756
Percent of all responding, affiliating hospitals			24.2%	28.6%	32.0%	33.0%	33.2%	34.1%
Percent of all Alliance-member hospitals			83.7%	85.8%	89.4%	89.3%	89.0%	90.3%

APPENDIX I.
TABLE I-2
Prevalence of Hospital Affiliations with Either DCA Core (AFIL) (1984-1991)
(CONTINUED)

	YEAR							
	1984	1985	1986	1987	1988	1989	1990	1991
Responding hospitals- By Bed Size Categories								
No. Small (1-99 Beds) reporting hospitals	422	569	531	575	565	557	562	559
No. Small affiliating with either	190	277	336	376	388	388	392	394
Percent of all responding, affiliating hospitals	15.8%	16.5%	16.9%	17.6%	17.7%	17.6%	17.6%	17.7%
Percent of all Small hospitals	45.0%	48.7%	63.3%	65.4%	68.7%	69.7%	69.8%	70.5%
No. Medium (100-299 Beds) reporting hospitals	956	1234	1288	1303	1303	1305	1297	1288
No. Medium affiliating with either	529	773	900	1034	1074	1096	1105	1109
Percent of all responding, affiliating hospitals	44.1%	46.0%	47.3%	48.6%	49.1%	49.8%	49.7%	50.0%
Percent of all Medium hospitals	55.3%	62.6%	75.3%	79.6%	82.6%	84.0%	85.2%	86.1%
No. Large (300+ Beds) reporting hospitals	708	887	859	858	839	822	844	822
No. Large affiliating with either	481	630	713	727	727	716	726	717
Percent of all responding, affiliating hospitals	40.1%	37.5%	35.8%	34.6%	33.2%	32.5%	32.7%	32.3%
Percent of all Large hospitals	62.6%	71.0%	83.0%	84.7%	86.7%	87.1%	86.0%	87.2%
Responding COTH hospitals	278	329	337	332	334	307	300	294
No. affiliating with either DCA	198	253	284	294	302	275	264	269
Percent of all responding, affiliating hospitals	16.5%	15.1%	14.3%	13.8%	13.8%	12.5%	11.9%	11.7%
Percent of all COTH hospitals	71.2%	76.9%	84.3%	88.6%	90.4%	89.5%	88.0%	88.4%
Responding medical school-affiliated hospitals	641	776	801	810	908	907	891	778
No. affiliating with either DCA	418	556	630	663	766	775	744	667
Percent of all responding, affiliating hospitals	34.8%	33.1%	31.7%	31.8%	35.0%	35.2%	33.5%	30.0%
Percent of all Medical-school affiliated hospitals	65.2%	71.6%	78.7%	81.9%	84.4%	85.4%	83.5%	85.7%
Responding residency-affiliated hospitals	690	836	862	871	870	870	902	884
No. affiliating with either DCA	451	593	670	705	726	736	753	748
Percent of all responding, affiliating hospitals	37.6%	35.3%	33.7%	33.8%	33.2%	33.5%	33.9%	33.7%
Percent of all Residency affiliated hospitals	65.4%	70.9%	77.7%	80.9%	83.4%	84.6%	83.5%	84.6%

KEY: PREV1.WK1

APPENDIX J

Table J-1
Incidence of New U.S. Urban Community Hospital Affiliations, By DCA and Year: 1984-1991

	1984	1985	1986	1987	1988	1989	1990	1991
Total AHA Reporting Hospitals	7,110	7,102	7,064	7,052	7,037	6,96'	6,871	6,829
Responding Urban Community Hospitals	2,146	2,690	2,638	2,736	2,707	2,684	2,703	2,669
Hospitals Newly Affiliating With DCAs	403	194	278	71	31	27	20	18
Percent of Responding Hospitals	31.2%	22.9%	48.3%	25.1%	15.3%	16.7%	15.4%	16.8%
Hospitals Affiliating with HMOs for the First Time	225	149	212	48	20	14	8	14
Percent of Responding Hospitals	17.4%	17.6%	36.8%	17.0%	9.9%	8.6%	6.2%	13.1%
Percent of Newly Affiliating Hospitals	55.8%	76.8%	76.3%	67.6%	64.5%	51.9%	40.0%	77.8%
Hospitals Affiliating with PPOs for the First Time	303	142	189	44	19	20	15	9
Percent of Responding Hospitals	23.5%	16.8%	32.8%	15.5%	9.4%	12.3%	11.5%	8.4%
Percent of Newly Affiliating Hospitals	75.2%	73.2%	68.0%	62.0%	61.3%	74.1%	75.0%	50.0%
Hospitals Affiliating with BOTH for the First time	125	97	123	21	8	7	3	5
Percent of Responding Hospitals	9.7%	11.5%	21.4%	7.4%	3.9%	4.3%	2.3%	4.7%
Percent of Newly Affiliating Hospitals	30.1%	50.0%	44.2%	29.5%	25.8%	25.9%	15.0%	27.8%
Hospitals Affiliating with Neither HMOs/PPOs for the First time	887	653	298	212	172	135	110	89
Percent of Responding Hospitals	68.8%	77.1%	51.7%	74.9%	84.7%	83.3%	84.6%	83.2%

Notes:

1. Numbers and percentages will exceed the total number of hospitals and 100%, respectively, each year, beginning with the row labeled "Affiliating with HMOs".

2. Because these data do not require eliminating observations due to missing or erroneous data, the total number of responding hospitals here will exceed the final sample size used in subsequent analyses of incidence.

3. Other tables specifying the incidence of hospital affiliations with by hospital characteristics (e.g., with DCAs, with HMOs, with PPOs and with both) are available from the author upon request.

APPENDIX K

TABLE I-1

Nonparametric Analysis of Incidence: Comparison of Hospital and Market Characteristics in New MHO Affiliations (MHO): 1985, 1988 and 1991

Organizational and Market Factors	1985 (N =193) MHO- YES Mean (SD) (N= 148)	MHO- NO Mean (SD) (N= 45)	Wilcoxon 2-Sample S-Value	1988 (N = 28) MHO- YES Mean (SD) (N= 18)	MHO- NO Mean (SD) (N= 10)	Wilcoxon 2-Sample S-Value	1991 (N = 17) MHO- YES Mean (SD) (N= 13)	MHO- NO Mean (SD) (N= 4)	Wilcoxon 2-Sample S-Value
ORGANIZATIONAL:									
PUBLIC	0.18	0.18	-.07 ns	0.111	0.1	-.04 ns	0.2308	0.5	.93 ns
	(0.39)	(0.39)		(0.32)	(0.32)		(0.44)	(0.58)	
PVTIO	0.11	0.16	.85 ns	0.1666	0.1	-.43 ns	0	0	.0 ns
	(0.31)	(0.37)		(0.38)	(0.32)		0.00	0.00	
PVTNP	0.71	0.67	- .54 ns	0.7222	0.8	.42 ns	0.7692	0.5	-.93 ns
	(0.46)	(0.48)		(0.46)	(0.42)		(0.44)	(0.58)	
SYSTM	0.39	0.42	.36 ns	0.28	0.40	.62 ns	0.23	0.00	-.94 ns
	(0.49)	(0.50)		(0.46)	(0.52)		(0.44)	0.00	
BEDS	85,614	77,474	.21 ns	65,555	85,097	.27 ns	90,236	131,029	.41 ns
	(68,302)	(52,648)		(51,439)	(57,715)		(68,806)	(91,837)	
SERVIX	0.56	0.56	.16 ns	0.56	0.58	.47 ns	0.67	0.78	1.79*
	(0.19)	(0.18)		(0.23)	(0.24)		(0.18)	(0.10)	
RESIDNT	14.37	16.51	.11 ns	6.28	12.40	1.12 ns	16.38	134.00	.34 ns
	(38.86)	(65.91)		(23.16)	(23.03)		(34.94)	(268.00)	
SENRITY	0.069	0.089	.44 ns	0.049	0.078	1.33 ns	0.073	0.188	1.3 ns
	(0.065)	(0.141)		(0.041)	(0.044)		(0.074)	(0.056)	
NEWEAST	0.16	0.18	.24 ns	0.39	0.30	-.43 ns	0.62	0.25	1.18 ns
	(0.37)	(0.39)		(0.50)	(0.48)		(0.51)	(0.50)	
MIDCENT	0.41	0.36	-.60 ns	0.17	0.10	-.43 ns	0.15	0.25	.34 ns
	(0.49)	(0.48)		(0.38)	(0.32)		(0.38)	(0.50)	
WEST	0.11	0.04	-1.39 ns	0.00	0.10	1.27 ns	0.15	0.00	-.71 ns
	(0.32)	(0.21)		0.00	(0.32)		(0.38)	0.00	
EFFICIENCY									
FTERED	2,633.8	2,668.2	-.75 ns	3,356.8	771.3	1.3 ns	2,116.6	53.0	.94 ns
	(8,368.2)	(4,282.6)		(4,821.4)	(2,272.8)		(3,973.0)	(30.3)	
ADCAP	1.05	1.09	.42 ns	0.67	0.97	-.43 ns	0.90	0.87	.06 ns
	(0.95)	(0.90)		(0.52)	(0.75)		(0.95)	(0.61)	
RATOS	0.95	1.07	1.01 ns	0.98	0.69	-1.5 ns	0.98	0.79	.93 ns
	(1.73)	(1.09)		(1.00)	(0.81)		(1.52)	(0.95)	
COSTFT	245,494	241,791	-.84 ns	326,477	113,448	1.3 ns	207,987	5,147	.94 ns
	(683,681)	(487,118)		(491,878)	(343,646)		(396,523)	(3,010)	
TECHF	0.65	0.68	.67 ns	0.64	0.69	1.2 ns	0.43	0.41	1.18 ns
	(0.21)	(0.23)		(0.24)	(0.13)		(0.25)	(0.19)	
MARKET									
ADCAP	25.31	11.71	-4.02 ***	21.00	15.00	.09 ns	34.31	9.00	-2.2**
	(28.83)	(12.92)		(23.46)	(15.66)		(27.46)	(11.37)	
NEWSER	0.11	0.23	3.45 ***	0.13	0.26	-1.13 ns	0.07	0.29	1.87*
	(0.15)	(2,391.00)		(0.20)	(0.31)		0.12	(0.34)	
HHI	0.15	0.29	3.97 ***	0.18	0.30	.53 ns	0.08	0.34	2.2**
	(0.14)	(0.23)		0.16	(0.31)		(0.07)	(0.24)	
RATIL	0.47	0.26	-4.21 ***	0.66	0.55	-.95 ns	0.67	0.53	-1.46 ns
	(0.27)	(0.26)		(0.13)	(0.34)		(0.21)	(0.15)	
ADCAP*NEWSER	0.14	0.27	2.48 **	0.00	0.35	2.2**	0.15	0.28	1.3 ns
	(0.26)	0.34		(0.12)	(0.40)		(0.42)	0.39	

Source: AHA Annual Survey of Hospitals computerized data base (1984-1991)

* Significant at the 0.1 level or less ** Significant at the 0.05 level or less *** Significant at the 0.01 level or less

TABLE E-2

Econometric Analysis of Incidence: Comparison of Hospital and Market Characteristics in New PPO Affiliations (PPO): 1985, 1988 and 1991

Organizational and Market Factors	1985 (N = 193) PPO- YES Mean (SD) (N= 142)	PPO- NO Mean (SD) (N= 51)	Wilcoxon 2-Sample Z-Value	1988 (N = 28) PPO- YES Mean (SD) (N= 18)	PPO- NO Mean (SD) (N= 10)	Wilcoxon 2-Sample Z-Value	1991 (N = 17) PPO- YES Mean (SD) (N= 8)	PPO- NO Mean (SD) (N= 9)	Wilcoxon 2-Sample Z-Value
ORGANIZATIONAL:									
PUBLIC	0.183	0.1764	-.18 ns	0.17	0	-1.29 ns	0.55	0	-2.4**
	(0.39)	(0.39)		(0.38)	0.00		(0.53)	0.00	
PVEIO	0.1197	0.1176	-.04 ns	0.22	0	-1.5 ns	0	0	0 ns
	(0.33)	(0.33)		(0.43)	0.00		0.00	0.00	
PVERP	0.6971	0.7058	.11 ns	0.61	1	2.2**	0.44	1	2.38**
	(0.46)	(0.46)		(0.50)	0.00		(0.53)	0.00	
SYSTEM	0.42	0.35	-.77 ns	0.39	0.20	-.98 ns	0.22	0.13	-.44 ns
	(0.49)	(0.48)		(0.50)	(0.42)		(0.44)	(0.35)	
BEDS	83,218	85,183	-.25 ns	66,644	83,137	1.02 ns	88,502	112,583	.75 ns
	(61,907)	(73,222)		(52,619)	(56,369)		(73,198)	(76,136)	
SENIOR	0.56	0.57	.72 ns	0.53	0.62	.67 ns	0.67	0.73	.22 ns
	(0.19)	(0.19)		(0.24)	(0.21)		(0.16)	(0.18)	
RESIDENT	15.74	12.43	-.69 ns	12.33	1.50	-1.3 ns	59.77	26.37	.65 ns
	(50.27)	(33.65)		(27.84)	(4.74)		(178.58)	(42.37)	
SENIORITY	0.079	0.058	-1.1 ns	0.058	0.062	.27 ns	0.113	0.045	-1.78*
	(0.098)	(0.058)		(0.047)	(0.040)		(0.078)	(0.038)	
INTEREST	0.11	0.31	3.3 ***	0.22	0.60	1.9*	0.22	0.88	2.5**
	(0.32)	(0.47)		0.43	(0.52)		(0.44)	(0.35)	
RESIDENT	0.39	0.41	.30 ns	0.11	0.20	.59 ns	0.22	0.13	-.44 ns
	(0.49)	0.50		0.32	(0.42)		(0.44)	(0.35)	
REST	0.13	0.00	-2.74 ***	0.06	0.00	-.67 ns	0.22	0.00	-1.3 ns
	(0.34)	0.00		0.24	0.00		(0.44)	0.00	
EFFICIENCY									
PTERD	1,970.9	3,900.4	.88 ns	2,691.5	1,968.8	.41 ns	57.8	3,401.0	-1.89*
	(3,958.2)	(13,287.2)		(4,434.9)	(4,040.1)		(39.5)	(4,707.1)	
RCHP	1.11	0.93	-.82 ns	0.77	0.80	1.12 ns	1.19	0.55	.67 ns
	(1.00)	(0.74)		(0.70)	(0.67)		(1.02)	(0.53)	
RALOS	0.88	1.24	1.87 *	0.77	0.86	.82 ns	0.39	1.55	.61 ns
	(1.67)	(1.99)		(0.86)	(1.15)		(0.70)	(1.74)	
COSTEPT	220,545	311,693	.34 ns	200,705	195,837	.42 ns	5,292	334,469	-1.89*
	(447,855)	(841,658)		(482,593)	(483,055)		(3,281)	(471,099)	
TECHEP	0.67	0.61	-1.94 *	0.72	0.55	-2.6**	0.40	0.45	-.66
	(0.22)	(0.20)		(0.02)	(0.18)		(0.22)	(0.26)	
MARKET									
RCHP	23.91	17.22	-.95 ns	19.86	19.30	-.70 ns	27.55	29.25	.11 ns
	(28.19)	(17.64)		(20.13)	(23.20)		(30.96)	(23.84)	
MYSHR	0.14	0.12	.02 ns	0.19	0.16	-.31 ns	0.18	0.05	.92 ns
	(0.19)	(0.15)		(0.27)	(0.22)		(0.27)	(0.05)	
HHI	0.18	0.19	1.00 ns	0.24	0.18	.98 ns	0.20	0.07	0 ns
	(0.18)	(0.14)		(0.25)	(0.18)		(0.21)	(0.04)	
HAFIL	0.42	0.42	-.13 ns	0.62	0.60	-.95 ns	0.63	0.64	.22 ns
	(0.28)	(0.28)		(0.27)	(0.14)		0.20	(0.22)	
RCHP*MYSHR	0.18	0.14	-.46 ns	0.23	0.08	-1.3 ns	0.30	0.04	-.92 ns
	(0.30)	(0.25)		(0.34)	(0.09)		(0.54)	(0.07)	

Source: AHA Annual Survey of hospitals computerized data base (1984-1991)

* Significant at the 0.1 level or less ** Significant at the 0.05 level or less *** Significant at the 0.01 level or less

TABLE E-1

Nonparametric Analysis of Incidence: Comparison of Hospital and Market Characteristics in Non HMO and PPO Affiliations (BOTH): 1985, 1988

Organizational and Market Factors	1985 (N = 193) BOTH- YES Mean (SD) (N= 97)	BOTH- NO Mean (SD) (N= 96)	Wilcoxon 2-Sample S-Value	1988 (N = 28) BOTH- YES Mean (SD) (N= 8)	BOTH- NO Mean (SD) (N= 20)	Wilcoxon 2-Sample S-Value	1991 (N = 17) BOTH- YES Mean (SD) (N= 5)	BOTH- NO Mean (SD) (N= 12)	Wilcoxon 2-Sample S-Value
ORGANIZATIONAL:									
PUBLIC	0.1855 (0.39)	0.177 (0.38)	-.15 ns	0.25 (0.46)	0.05 (0.22)	1.47 ns	0.6 (0.55)	0.1666 (0.39)	1.67*
PVTO	0.103 (0.31)	0.1354 (0.34)	.68 ns	0.375 (0.52)	0.05 (0.22)	2.14**	0 0.00	0 0.00	0 ns
PVTPP	0.7113 (0.46)	0.6875 (0.47)	-.36 ns	0.375 (0.52)	0.90 (0.31)	-2.81***	0.4 (0.55)	0.8333 (0.39)	-1.67*
SYSTEM	0.61 (0.49)	0.39 (0.49)	-.36 ns	0.375 (0.52)	0.30 (0.47)	.34 ns	0.4 (0.55)	0.08 (0.29)	1.43 ns
DAYS	85,882 (65,961)	81,527 (64,186)	-.40 ns	43,577 (36,708)	84,117 (55,533)	-1.38 ns	54,481 (33,698)	118,731 (77,916)	-1.27 ns
SERMIX	0.55 (0.20)	0.57 (0.18)	.78 ns	0.48 (0.23)	0.60 (0.22)	-1.83 ns	0.58 (0.15)	0.74 (0.16)	-1.98**
RESIDENT	15.39 (41.47)	14.34 (51.11)	-.51 ns	12.25 (36.65)	6.95 17.12	.14 ns	0.08 (0.09)	62.25 (153.42)	-1.11 ns
SENSITY	0.075 (0.071)	0.072 (0.104)	-.59 ns	0.03 (0.04)	0.070 (0.042)	-1.71*	0.118 (0.099)	0.066 (0.052)	.68 ns
NORTHEAST	0.08 (0.28)	0.25 (0.44)	3.12 ***	0.13 (0.35)	0.45 (0.51)	-1.56 ns	0.20 (0.45)	0.67 (0.49)	-1.64 ns
MIDWEST	0.40 (0.49)	0.39 (0.49)	-.24 ns	0.13 (0.35)	0.15 (0.37)	-.13 ns	0.20 (0.45)	0.17 (0.39)	.08 ns
WEST	0.18 (0.38)	0.02 (0.14)	-3.59 ***	0.00 0.00	0.05 (0.22)	-.55 ns	0.40 (0.55)	0.00 0.00	2.17**
EFFICIENCY									
FTERD	1,925.8 (3,861.3)	3,884.8 (10,845.1)	.14 ns	5,891.7 (5,410.8)	1,370.1 (3,248.7)	-1.86*	61.7 (48.9)	2,285.8 (4,100.9)	1.12 ns
ROCP	1.12 (1.05)	1.00 (0.82)	-.37 ns	0.52 (0.57)	0.88 (0.62)	- .71 ns	1.46 (1.26)	0.66 0.55	.61 ns
RALOS	0.79 (1.56)	1.16 (1.94)	2.58 **	1.13 (0.84)	0.67 (0.98)	1.53 ns	0.08 (0.18)	1.38 (1.52)	-1.6 ns
COSTPP	218,688 (430,731)	278,927 (695,676)	-.41 ns	489,767 (569,888)	154,643 (366,983)	-1.86*	5,488 (3,697)	224,695 (489,298)	1.1 ns
TECHPP	0.67 (0.21)	0.64 (0.22)	-1.14 ns	0.75 (0.27)	0.62 (0.17)	1.38 ns	0.48 (0.26)	0.44 (0.23)	- .38 ns
MARKET									
HCHP	29.57 (31.44)	14.64 (15.77)	-3.11***	23.13 (25.28)	17.55 (19.35)	.62 ns	42.48 (34.66)	22.58 (21.74)	1.27 ns
HSTAR	0.11 (0.15)	0.17 (0.28)	-2.72***	0.10 (0.18)	0.21 (0.27)	1.56 ns	0.10 (0.20)	0.13 (0.21)	.14 ns
HHI	0.13 (0.13)	0.23 (0.28)	-3.91***	0.17 (0.14)	0.24 (0.26)	- .44 ns	0.09 (0.11)	0.16 (0.18)	0 ns
HAFIL	0.58 (0.25)	0.35 (0.28)	-4.14***	0.72 (0.18)	0.58 (0.25)	2.05**	0.71 (0.20)	0.61 (0.20)	1.65 ns
HCHP*HSTAR	0.13 (0.27)	0.28 (0.38)	1.35	0.08 (0.16)	0.22 (0.32)	- .92 ns	0.32 (0.68)	0.12 (0.24)	- .14 ns

Source: AHA Annual Survey of hospitals computerized data base (1984-1991)

* Significant at the 0.1 level or less ** Significant at the 0.05 level or less *** Significant at the 0.01 level or less

VITA

Richard R. Bannick received his Master in Health Administration degree from the Ohio State University, Columbus, Ohio in 1981, and his Bachelor of Arts degree in business administration from the University of Washington, Seattle Washington in 1975. As an active duty Lieutenant Colonel in the United States Air Force, he began doctoral studies in health services organization and research in the Department of Health Administration at the Medical College of Virginia, Virginia Commonwealth University in Richmond, Virginia. During his study, he was a teaching assistant for classes in Health Services Research and Health Economics in his Department's Masters degree curriculum. He has authored or co-authored four publications, and completed research for the U.S. Health Care Financing Administration in assessing utilization management systems in HMOs enrolling Medicare beneficiaries.

Lt Col. Bannick is currently assigned to the Managed Care Division of the USAF Surgeon General's Office, Washington, DC. His eighteen years of active duty service has provided broad administrative and consulting experience in the Department of Defense (DOD) health care arena and extensive involvement with DOD, The Congress, the General Accounting Office, the Office of Management and Budget and the Department of Veterans Affairs. In addition to holding hospital and clinic administrative positions, he has served as commander of two Air Force medical facilities. He and his wife, Connie, have two wonderful children, Sara and Jonathan.